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LATE ANCIENT AND MEDIEVAL POPULATION

J. C. RUSSELL
Professor of History, University of New Mexico

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PREFACE

"Demography is perhaps the most important of all the social sciences." [1] This is the opinion of one great medieval historian, Pirenne, quoted by another great medievalist, Lot. Yet, no large study of medieval population has been published and the standard treatment of ancient population dates from 1886. Population history has tended to be lost among the fields of history, economics, and sociology. There is no professorship of the history of population at present and no periodical for its study.[2] Many of the articles on the subject are well hidden in a wide variety of publications and many of the data about it remain in local archives. The first purpose of this study has been to present the evidence from these studies and from the archives of some of these localities. The result is a surprisingly clear outline of the demographic developments of the period.

The time and geographical area covered constitute a a convenient unit for the subject. The latter part of the Roman Empire is used as the starting point because there is sufficient information about its population to justify conclusions upon its data about many demographic developments. This is true also for the period after A.D. 1200. Assuming then that the information for these periods is reasonably sound, trends can be outlined for the period lying between them. The area consists of Europe and the countries around the Mediterranean: it is the classical world and its barbarian neighbors, and is a natural unit politically as well as geographically.

The subject matter is that of ordinary demography except for the omission of migration. In the Middle Ages many cases of migration are primarily political maneuvers by ruling class groups affecting the mass of the people very little. The phases of demography taken up for consideration are total population, proportions by age, sex, and marriage and their relation to such factors as birth and mortality. Although the information is quite scant for many areas and for much of the time, the evidence of widespread and consistent relationships gives general validity to the study.

The demographic approach to late ancient and medieval society produces a quite favorable impression of that culture. Unlike our own time (and this is surprising) that society maintained a firm grip upon its numbers and avoided the great problem of overpopulation which is plaguing much of the world today. It shows that humanity can, if it wishes, solve this very dangerous problem. This is a very comforting thought to our harassed world today. Population was small since it was adjusted to an agricultural society with a modest commercial development. However, it varied considerably within the period since it had to accommodate itself to a marked change of climate and to two great plagues, in the sixth and the fourteenth centuries. These demographic changes had profound effects upon the society of the period of a dynamic character.

The study of European-Mediterranean population followed naturally the more detailed examination of the great body of demographic data in my *British Medieval Population* (1948), the research for which study was largely financed by the American Philosophical Society. The research on the continental data was aided by grants from the Social Science Research Council in the summers of 1949 and 1951. A Visiting Professorship (Fulbright) at the University College of Wales, Aberystwyth, enabled me to use the British and continental libraries and archives during the year 1952–1953. This has been supplemented by the use of American libraries with excellent collections of sources for demographic study.

At Aberystwyth I enjoyed the advice of my colleagues, R. F. Treharne, S. H. F. Johnston, I. J. Sanders, and E. B. Fryde as well as the surprisingly fine facilities of the College Library and the National Library of Wales. Upon various points I have received information from C. M. Cipolla, J. Reglá Campistol, J. Vicens Vives, P. Wolff, K. F. Helleiner, Sidney Painter, Sir Harold Idris Bell, Pearl Kibre, A. E. R. Book and R. S. Smith. Professor T. O. MacAdoo has read the chapter on demographic theory. For assistance of various types I am indebted to Theresa Gillett, Helen McIntyre, Genevieve Porterfield, and Marjorie J. Reigstad. Finally, my greatest debt is to my wife, Ruth W. Russell, who has improved the manuscript in many ways and has been a source of encouragement throughout the years of its composition.

[1] Lot, *Recherches*, vii.

[2] The *Population Index*, published by the Population Association of America, has been invaluable for indexing publications of the last twenty years.

ABBREVIATIONS

A.T.: Atlas archéologique de la Tunisie.

Beloch, *BGRW:* K. J. Beloch, *Die Bevölkerung der griechisch-römischen Welt,* Berlin, 1886.

Beloch, *BI:* K. J. Beloch, *Bevölkerungsgeschichte Italiens* 2 v., Berlin, De Gruyter, 1937 and 1939.

BN: Bibliothèque Nationale, Paris.

Bury: J. B. Bury, *History of the later Roman empire* (A.D. 395–565), London, 1923.

Censo de población: Censo de población de las provincias y partidas de la Corona de Castilla en el siglo XVI, Madrid, 1829.

CIL: Corpus inscriptionum Latinarum consilio et auctoritate Academiae Litterarum Regiae Borussicae editum, Berlin, 1863 ff., Koenigliche Akademie der Wissenschaften.

Cuvelier: J. Cuvelier, *Les dénombrements de foyers en Brabant* (xive–xve siècle), Brussels, Kiessling, 1912. Publications in quarto. Academie royale des sciences, des lettres et des beaux-arts de Belgique. Commission royale d'histoire.

DACL: Dictionnaire d'archéologie chrétienne et de liturgie, ed. F. Cabrol et H. Leclercq, Paris, Letouzey et Ané, 1903 ff.

Devic et Vaissete: C. de Vic et J. Vaissete, *Histoire générale de Languedoc,* edition with notes by A. Molinier, Toulouse, E. Privat, **6**, 1879; **9**, 1885 and **10**, 1885.

Dickinson: R. E. Dickinson, *The west European city; a geographical interpretation,* London, Routledge and Paul, 1951.

EUI: Enciclopedia universala ilustrada Europeo-Americana, Bilbao, Espasa-Calpe, 1907 ff.

Frank, *ESAR:* Tenney Frank, *Economic survey of ancient Rome,* 5 v., Baltimore, Johns Hopkins Press, 1933–1940.

Ganshof: F. L. Ganshof, *Étude sur le developpement des villes entre Loire et Rhin au moyen age,* Paris, 1943, Presses universitaires de France, 1943.

Grenier: A. Grenier, *Manuel d'archéologie Gallo-Romaine,* 2 v., Paris, 1931, 1934. These are volumes **5** and **6** of J. Dechelette, *Manuel d'archéologique préhistorique et Gallo-Romaine.*

Harkness: A. G. Harkness, Age at marriage and at death in the Roman Empire, *Trans. Amer. Philol. Association* **27**: 35–72, 1896.

Hitti: P. K. Hitti, *History of the Arabs,* Princeton, Princeton University Press, 1936.

JRS: The Journal of Roman Studies (London, 1911–, The Society for the promotion of Roman Studies).

Keyser, *BD:* E. Keyser, *Bevölkerungsgeschichte Deutschlands,* Leipzig, S. Hirzel, 1941.

Keyser, *DS:* E. Keyser, Deutsche Städtebuch. *Handbuch städischer Geschichte,* Berlin, Kohlhammer, 1939, 1941, 1952.

Leo Africanus: Hasan ibn Muhammad al Wazzan, al Fasi, afterwards Giovanni Leone Africano, *De l'Afrique,* French translation by Jean Temporal, Paris, 1830.

Lot, *Recherches: Recherches sur la population et le superficie des cités remontant a le periode Gallo-Romaine,* 3 v., Paris, Champion, 1945–1950.

R.E.: Pauly's *Realenzyklopädie der klassischen Altertumswissenschaft,* eds. G. Wissowa, W. Kroll, K. Mittelhaus und K. Zieglar, Stuttgart, Metzler, 1893 ff.

Polyptyque de l'Abbé Irminon: B. Guerard, ed. *Polyptyque de l'Abbé Irminon,* Paris, 1844.

Proceedings, Rome: *Proceedings of the International Congress for Studies on Population,* Rome, 7–16 September 1931, ed. C. Gini, Rome, Istituto poligrafico dello stato libreria, 1933–1934.

Püschel: A. Püschel, *Das Anwachsen der deutschen Städte in der Zeit der mittelalterlichen Kolonialbewegung,* Berlin, K. Curtius, 1910.

Relazioni: Relazioni degli ambasciatori Veneti al Senato, ed. E. Alberi, Florence, Società editrice fiorentina, etc., 1839–1863.

Richter: O. Richter, Zur Bevölkerungs- und Vermögensstatistik Dresdens im 15 Jahrhundert, *Neues Archiv für sächsische Geschichte und Altertumskunde* **2**: 273–289, Dresden, W. Baensch, etc., 1881.

Russell, *BMP:* J. C. Russell, *British medieval population,* Albuquerque, University of New Mexico Press, 1948.

IX Hist. Congress: IXe Congrès International des Sciences Historiques, Paris, 1950, Paris, Libraire Armand Colin, 1950.

LATE ANCIENT AND MEDIEVAL POPULATION

J. C. Russell

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I. THE STUDY OF LATE ROMAN AND MEDIEVAL POPULATION

Neither the Romans nor the people of the Middle Ages seem to have had any interest in those topics now usually included in the subject of population: numbers of people divided according to sex, age, or social groups. They seldom give numbers of total population and when they do they usually guess upon a not too accurate basis. There are left from that period no studies of length of life, of migration, of fertility, or of mortality. This is rather strange since the scholars of that period were profoundly concerned about a great many questions which touched upon sex, marriage, life, and death. It was not that they disliked statistical concepts since they mastered certain phases of mathematics and astronomy and knew a great deal about taxation which involved use of large figures and an understanding of them. Fortunately their problems and records of taxation left quantities of information which do permit some demographical study even though, as we shall see, it has its limitations as evidence.

1. EARLY ATTITUDES TOWARD POPULATION STUDY

In two of the great traditions which lie behind so much of the thinking of the Middle Ages, the Hebrew and the Roman, early efforts were made to ascertain the number of the people. Tradition in the Bible has it that as punishment for his attempt to number the people David had to choose among three terrible alternatives: a three-day pestilence, three months of military defeat, or seven years of famine.[1] It is no wonder that the

[1] II Samuel 24: 1–16.

Jews did not repeat the experiment and handed on the idea that such an act was wrong. For centuries the Roman censors conducted surveys of the number of Roman citizens before dropping the practice in the first century A.D. Although historians report the gross numbers of the citizens, they only rarely attempt to use the numbers to give an indication of the total population or of the provinces or other divisions of the empire. Had there been a simple poll tax, such as was to be tried in the later Middle Ages, the information might have been available for an estimate of total population.

If one may hazard a reason for the lack of interest in demography on the part of Rome and the Middle Ages, it is that population is essentially a democratic subject involving the assumption that there is a certain equality of man. What importance is there to knowing that there are so many thousands of persons in a country if one believes in the inherent inequality of persons in that country? It was probably not that they thought this out but that it worked out this way in practice. Ancient and medieval kings seldom needed to know gross numbers although they might wish to know the numbers of knights or of some other class of population. Similarly they were not interested in the problem of public health which might raise the need for information about vital statistics. Demography is essentially the science of the masses of people rather than of the ruling classes and only when the masses tended to become the ruling class did the subject of demography become important.[2]

Before the democratic developments in government which lay behind the new population statistics, the early modern curiosity about the human race had led to a certain amount of speculation upon earlier peoples and their numbers. Gibbon, for instance, collected some of this information for his great work on the decline and fall of the Roman Empire.[3] He noted that Machiavelli and Mariana believed in a very large ancient population, whereas Robertson and Hume did not feel that ancient population was so large.[4] In England earlier writers than the last two mentioned also held very high estimates of population.[5] It was only natural that the past, particularly, the Roman past should have been more heavily populated in imagination than it actually was.

Although these men, like many scholars of the Enlightenment, did not exhibit a very exact knowledge of their subject and based their conclusions upon quite crude guesses, they were to have much influence upon later thought. Their presumption was largely that of a past Golden Age, a world superior in population as it was in technology and building operations to that of the Middle Ages. While the picture of the Golden Age has largely disappeared from historical thought, the impact of its axioms still has its influence upon thinking today. Thus it was really difficult for historians of even careful training to accept the low estimates of the first historians who gave careful attention to the evidence.

In particular, the essay of David Hume, written apparently about 1742, presented a good case against large population in the ancient world.[6] He emphasized the tendency of slave populations to reproduce only slowly and to be drawn mostly from outside of the areas of the cities and farms in which they could be used profitably. He cautioned against the acceptance of the wildly exaggerated figures so frequently presented by ancient writers and pointed out the smallness of the apparently reliable figures. He noted indeed the amazing remark by Herodian that the palace of Nero was nearly as large as the rest of the city of Rome and suggested that Rome itself was not as large as many thought.[7] He noticed also that certain writers near the time of Christ gave indications that the climate then was colder than at a later period but did not realize the significance of his observation (that the climate was really colder) and suggested that the increase in cultivation had raised the temperature of the area.[8]

The interest shown by these early writers seems not to have affected two of the great authors whose expositions tended to dominate the thinking of the time: Montesquieu and Malthus. The former in his *De l'Esprit des Lois* included population [9] among the many factors in political development but assigned it no great influence and thus tended to cause others to neglect the topic. Malthus added to this neglect by his attitude toward the subject. He explained, as so many remember, that population changed with economic conditions. He suggested that although subsistence increases in arithmetical progression, population increases in geometrical progression.[10] Population is thus an inert factor which follows the action of other factors. If only recently scholars have come to regard population as a potentially active force in regard to the present, it is not surprising that historians have not considered it a force in shaping the past. Most of the work on popu-

[2] On the general subject of the utility of the history of population: Chevalier, L., Pour une histoire de la population, *Population* **1**: 245–256, 1946.

[3] Gibbon, E., *History of the decline and fall of the Roman Empire*, ed. H. H. Milman, **1**: 283, New York, 1905.

[4] Gibbon cites: Machiavelli, *History of Florence*, I; Mariana, *Hist. Hisp.* **1**: ch. i; Robertson, *Hist. Charles V;* Hume, *Essays.*

[5] Russell, *BMP*, 6–8; Wallace, R., *A dissertation on the numbers of mankind*, Edinburgh, 1753. Wallace uses very high numbers.

[6] Hume, D., Essay XI. Of the populousness of ancient nations, *Essays, moral, political and literary*, ed. T. H. Green and T. H. Grose, **1**: 381–443, London, 1875.

[7] *Ibid.*, 429.

[8] *Ibid.*, 433–444.

[9] Des lois dans le rapport qu'elles ont avec le nombre des habitants, in xxiii. Written about 1748–1749.

[10] On his influence: Spengler, J. J., Malthus' total population theory: a restatement and reappraisal, *Canadian Jour. Economics and Polit. Sci.* **11**: 83–110, 234–264, 1945.

lation was of a casual sort and was seldom thought to be particularly significant.

2. K. J. BELOCH

The classical historian, K. J. Beloch, published his great study of ancient population in 1886 and remained interested in the field of population during the rest of his long life.[10a] Later he wrote important articles upon medieval and Renaissance demography and, after retiring from the University of Rome, he wrote three volumes upon the history of Italian population.[10b] He acknowledged his debt to Hume who "in a flash of genius—had outlined the essential points which were necessary in any study of classical population." [11] He was responsible for developing a technique of the study of ancient population and subjected a wide variety of data reported by classical writers to rigorous critical treatment. Much of the information about even medieval population is not available for ancient population. Thus a greater degree of criticism and interpretation must be used. Beloch presented evidence about the areas of each part of the classical world in order that comparative density of population might be considered.

TABLE 1

BELOCH'S ESTIMATE OF ROMAN POPULATION A.D. 14

Name of area	Area in 1,000 sq. km.	Estimated population (1000's)	Number to the sq. km.
Europe			
Italy	250	6,000	24
Sicily	26	600	23
Sardinia-Corsica	33	500	15
Iberia	590	6,000	10
Narbonensis	100	1,500	15
Gaul	535	3,400	6.3
Danube	430	2,000	4.7
Greece	267	3,000	11.2
Total	2,231	23,000	9.7
Asia			
Asia (province)	135	6,000	44
Asia Minor (besides Asia)	412	7,000	17
Syria	109	6,000	55
Cyprus	9.5	500	52
Total	665.5	19,500	34
Africa			
Egypt	28	5,000	179
Cyrenaica	15	500	33
Africa	400	6,000	15
Total	443	11,500	26
Roman Empire	3,339.5	54,000	16

Source: Beloch, *BGRW*, 501–507.

TABLE 2

ESTIMATES OF BYZANTINE POPULATION

Time	Estimate (millions)	Area (1,000 sq. km.)
First century (whole empire)	70	
Fourth century, East	26	
West	24	
Justinian	30	
Mid-eleventh	20	1,000
Time of Comneni	10–12	650
Michael VIII	5	300

Source: Stein, E., Introduction à l'histoire et aux institutions byzantines, *Traditio* **7**: 154, 1949–1951.

Beloch devoted most of his attention to total population largely because the evidence was of that type. He mastered the elements of population study and desired to offer evidence about age groups and proportion of population by sex and status. He produced the first estimate of Roman age grouping [12] and later in his *Bevölkerungsgeschichte Italiens* he presented evidence for other phases of population study. He probably carried the study of Roman population about as far as he could, and no one has really improved upon his work since then.[13] He had the proper suspicion of some of the high estimates offered by classical writers. Such data as the census and reports of numbers of heads also presented a certain amount of difficulty of interpretation. Beloch occasionally mentions the area of cities but did not pursue the matter through either comparison with population and area of medieval cities or through study of ancient housing. No one else has done so either.

However, Beloch's estimates for the eastern half of the Roman Empire seem to have received more ready acceptance than for the west. Gibbon's figure of 120 million for the first century has been reduced to 70 million by Stein and to 50 million for the fourth (table 2). Bury was willing to accept 70 million for the latter date.[14] Stein, however, estimated the population of the Byzantine Empire at various stages at rather modest figures. Thus the decline of the Byzantine Empire can be traced quantitatively through the estimates of one

[10a] *Die Bevölkerung der griechnisch-römischen Welt*, Berlin, 1886. The work is reprinted in the fourth volume (1909) of Pareto's *Biblioteca di storia economica*. In this volume there are other articles by Beloch, Hume, Cicotti, Seeck, Kornemann, Meyer, Nissen, and Holm.

[10b] See note 16. The *Bevölkerungsgeschichte Italiens* was published posthumously: **1**: Berlin, 1937; **2**: Berlin, 1939. The last volume is still in typescript.

[11] Beloch, *BGRW*, 35. A later book on population considers (with certain exceptions) only the early part of the period. Cavaignac, E., *Population et capital dans le monde méditérranéan antique*, Strasbourg, 1923.

[12] Beloch, *BGRW*, 41–54.

[13] For a recent statement of the difficulties: Jones, A. H. M., Ancient economic history, an inaugural lecture delivered at University College, London, 1948.

[14] Bury, **1**: 62. He has other information about demography on **1**: 88, 105 and **2**: 62, 104 and 107.

who knew his Empire well. Yet it remains that these are unanchored conjectures since demographic information about that Empire is singularly scarce.

As frequently happens, the study of ancient history is in advance of the study of the medieval period since it was studied earlier and with more enthusiasm for a long period of time. There is no book at all devoted to the study of medieval population of Europe as a whole and only a few general articles of importance.[15] The earliest of these was by Beloch. The study of the population of individual countries has fared somewhat better: there are studies for many of them, some very good. For other countries the problem is difficult because of the paucity of evidence which has survived about them.

The tendency to use high figures has persisted despite Beloch's work. The historian of Gaul, C. Jullian, believed in them and following him Grenier has suggested 15–20 million for that Roman diocese.[16] The former presented his idea of the population of cities as well. The largest was Lyons with 200,000. Then there followed in the 80–100,000 class Arles, Autun, Cologne, Mainz, Narbonne, Nimes, Trèves, and Vienne. In the group having 40–60,000 were Aix, Béziers, Bordeaux, Fréjus, Orange, Poitiers, Reims, Saintes, Sens, and Toulouse.[17] If these cities were really as large as the figures indicate, the total population of Gaul probably would have reached the total suggested by Jullian although there is considerable tolerance there. The problem of the size of the cities has recently been tackled by Ferdinand Lot who has endeavored to ascertain the size of the area covered by the walls which were built in most of the cities as the barbarians approached Gaul in the third century.[18] He has shown that it would have been very difficult to crowd the alleged populations into the small areas enclosed by the walls.

In spite of the attention given it by Beloch population has not been accepted as an integral and necessary part of the study of medieval history. Thus, histories of the whole period or of parts of it either geographically or chronologically have been written which give either the most casual or no attention to the subject. Even in the field of ancient history Tenney Frank's *Economic History* devotes some attention to population in each of the sections of the collection but no advance seems to be made over Beloch in most instances.[19]

Medieval sources, especially of the later period, have much more evidence to offer than ancient history and also more problems of criticism and interpretation. The studies of demographic methods appear in some numbers[20] especially for the records of the German cities. The works of Hegel, Lamprecht, Schönberg, and Bücher of Germany, of Guérard, Levasseur, and Lot of France, of Pirenne and Cuvelier of the Low Countries, Gonzalez of Spain and especially of Beloch have done much to elucidate the subject of demographic sources and methods. These are, of course, not the only names of authorities in the field. But by and large attention has been focused upon regional and local rather than general population.

3. SOUTHERN EUROPE: ITALY, FRANCE, SPAIN

Even before Beloch published his great work on classical population scattered works upon population had appeared in Italy. The two earliest apparently were upon the history of Florence,[21] a history which Florentines themselves had made interesting during the Renaissance by their historiography. The hearth taxes of the later Middle Ages offered data promising for the study of population and were used and, in some cases, published in this early period.[22] Even the epidemics of the period were subjected to study.[23] The early Middle Ages characterized by lack of demographic sources received relatively little attention.[24]

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[15] Beloch, J., Die Bevölkerung Europas im Mittalter, *Zs. f. Socialwiss.* **3**: 405–423, 1900; Die Bevölkerung Europas zur Zeit der Renaissance, *ibid.* **3**: 765–786, 1900. Some information is also in his Die Bevölkerung im Altertum, *ibid.* **2**: 505–514, 1899. 'Bevölkerung,' *Handwörterbuch der Staatswissenschaft,* ed. L. Elster, Jena, 1924. Russell, J. C., Medieval population, *Social Forces* **15**: 503–511; Late medieval population patterns, *Speculum* **20**: 157–171, 1945. Abel, W., Bevölkerungsgang und Landwirtschaft im ausgehenden Mittelalter, *Schmollers Jahrbuch* **58**: 33–62, 1934.

[16] Grenier in Frank, *ESAR* **3**: 455, 531.

[17] Grenier says that these figures come from C. Jullian, *Histoire de la Gaule* **5**: 36–38, Paris, 1920.

[18] Lot, *Recherches.*

[19] Two studies on methods: Walek-Czernecki, Sur les methodes de la statistique des populations anciennes, *La Pologne au VIIe Congrès international des sciences historiques,* Warsaw, 1933; Cicotti, E., Indirizzi e methodi negli studi di demografia antica, *Metron* **9**: 122, 1937 and in Pareto, *Bibliotheca di storia economica,* vii–ciii.

[20] Special studies on method and sources are: von Inama-Sternegg, K. T., Die Quellen der historischer Bevölkerungsstatistik, *Statistische Monatschrift* **12**: 387–408, 1886; Stoll, H., Bevölkerungszahlen aus frühgeschichtlicher Zeit, *Die Welt als Geschichte* **8**: 69–74, 1942; Daszyńska, Zofia, Stoff und Methode der historischer Bevölkerungsstatistik, *Jahrbücher für Nationalökonomie und Statistik* **66**: 481–506, 1896. The titles of the works of the other persons mentioned above appear in the following pages. I have seen but not used Roger Mols' *Introduction a la démographie historique des villes d'Europe du XIV^e^ au XVIII^e^ siècle,* 3 v., Louvain, Publications Universitaires de Louvain, 1954–1956, an excellent work.

[21] Pagnini della Ventura, G. F., *Della decima dei Fiorentini,* Lucca, 1795; Lastri, M., *Ricerche sull 'antica e moderna popolazione di Firenze,* etc., Florence, 1775.

[22] Cagnazzi, L. de S., *Saggio della popolazione del regno di Puglia* **1**, Naples, 1820; d'Arco, C., *Studi statistici sulla popolazione di Mantova,* Mantua, 1839; Foglietti, R., *Il catasto di Macerata dell'anno 1268,* Macerata, 1881; Capasso, B., *Sulla circoscrizione e sulla popolazione della città di Napoli,* etc., Naples, Atti dell' Accademia Pontiniana, 1883.

[23] Corradi, *Annali dell' epidemie occorse in Italia,* Bologna, 1865.

[24] Salvioli, G., Sullo stato e la popolazione d'Italia prima e dopo le invasioni barbariche, *Atti della R. Accademia di Palermo,* 3rd ser., **5**: 3–76, 1900.

Demographic interest in Italy remained for the most part local, touching city states or feudal divisions.[25] By way of contrast there was the long study by Maggiore-Perni upon the population of Sicily, probably the first comprehensive study of any Italian area.[26] A year earlier Motta had presented a study of mortality of Milan at the end of the Middle Ages.[27] Shortly before the First World War, Pardi commenced a long series of articles touching many parts of the peninsula.[28] Some scattering studies appeared after 1918 including a notable one by Egidi which did much to define the number to a unit of taxation for the thirteenth century.[29]

In his years of retirement Beloch continued with his study of population even planning a comprehensive study of European demography beginning with Italy. The first part of the latter was published posthumously in 1937 and the second in 1939. The third, devoted to northern Italy has never been published, but a long series of articles appearing in the proceedings of the population congress at Rome of 1931 does much to fill the gap, while there have been recent articles which indicate much interest in the subject.[30] Italy has been fortunate in having a survey of demographic sources produced under satisfactory auspices.[31]

The interest in French demography began at least in the eighteenth century with respect to medieval population. Voltaire knew of the great French survey of population of 1328.[32] This list of hearths was the basis of lectures given before the Académie des Inscriptions et Belles-lettres on October 16 and 23, 1829, which, however, were not published until 1845 [33] by Dureau de la Malle. From the eighteenth century he had inherited a belief in a large population: the result of feudalism with its need for manpower, concubines of the clergy, advice of the Church to increase and multiply, and freedom from syphilis and serfdom. Thus he was inclined to believe that the survey affected but a modest part of France and hazarded a minimum of 34.6 million in population. He chose five as the index to the hearth, equating it with the manse in the great survey of Charlemagne's time, the *Polyptyque d'Irminon* which had been published a few years earlier. He also added the missing province of Brittany.[34]

The *Polyptyque d'Irminon* has been published twice: in 1844 and 1886–1895.[35] The publication of this great document and other evidence of the Frankish realm [36] produced a long series of articles upon problems of demography of the period. Some of it was very pessimistic as to the value of such research and there was no consensus of opinion.[37] In the seventies good records of population from Normandy [38] and Burgundy were published.[39] Both of the editors supplied much documentation although both also wrote before many of the modern bibliographical works were available. About the same time another writer tried to show that the population of fourteenth-century France was as large as it was in his own day. Even using his figures, it is somewhat difficult to get that result, and if one uses an index figure of less than five for a hearth the whole attempt collapses. The question of French population was soon considered upon a more comprehensive scale.[40]

[25] Salvioni, G. B., La popolazione di Bologna, etc., *Atti della R. Deputazione di Storia Patria,* 3rd ser., **8**, Bologna, 1890; Luzzatto, G., Il censimento della popolazione nel ducato d'Urbino nel sec. XVI, *Le Marche illustrate nella storia,* Fano, 1902; Ottolenghi, D., Studi demografici sulla popolazione di Siena, Siena, *Studi Senese* **24**, 1907; Rodolico, N., *La democrazia fiorentina nel suo tramonto,* Bologna, 1905.

[26] Maggiore-Perni, *Popolazione della Sicilia dal X al XVIII secolo,* Palermo, 1892.

[27] Motta, E., Morti in Milano dal 1452 al 1552, *Archivio Storico Lombardo* **18**: 241–286, 1891.

[28] Sapori, A., *Le marchand Italien au moyen âge,* 94–96, Paris, 1948.

[29] Egidi, P., Ricerche sulla popolazione dell'Italia meridionale nei secoli XIII e XIV, *Miscellanea di studi storici in honore di G. Sforza,* 731–750, Lucca, 1920.

[30] Beloch, *BI* **1**: iii. These volumes were published under the direction of G. De Sanctis. For the congress articles see Proceedings, Rome, **1**. Luzzatto, G., L'inurbamento delle popolazioni rurale in Italia nei secoli XII e XIII, *Studi in onore di E. Besta* **2**: Milan, 1938; Cipolla, C., Profilo di storia demografica della città di Pavia, *Boll. St. Pavese* **6**: 5–87, 1943; Popolazione e proprietari delle campagne, etc., *Boll. della Soc. Pavese di St. Patria* **46**: 85–97, 1947; Fiume, E., La demografia fiorentina nelle pagine di Giovanni Villani, *Archivio St. Italiano* **108**: 78–158, 1950; bibliography in A. Sapori, *Le marchand Italien au moyen âge,* 94–97, 1948; *Econ. Hist. Rev.,* 1951.

[31] *Fonti archivistiche per lo studio dei problemi della popolazione fino al 1848,* Rome, Comitato italiano per lo studio dei problemi della popolazione, 1933–1940.

[32] *Dictionnaire philosophique,* population, sect. iii; *Remarques de l'essai sur les mœurs, Melanges, 1783,* 183. From Velly, Villaret et Garnier, *Histoire de France* **10**: 24.

[33] Dureau de la Malle, A., Mémoires sur la population de la France au XIVe siècle, *Mem. d. l. Acad. d. Inscriptions et B–L.* **14** (*2*): 36–53, 1845; also *Bibl. Ec. Charles* **2**: 167–176, 1840.

[34] Probably from Moreau de Beaumont, *Mémoires concernant les impositions et droits* **2**: 265, Paris, 1769.

[35] Guerard, B., *Polyptyque de L'abbé Irminon,* Paris, 1844; Longnon, A., *Polyptyque de l'abbaye de St. Germain des Prés,* Paris, 1886, 1895.

[36] Wartmann, H., *Urkundenbuch der Abtei S. Gallen,* Zurich, 1863.

[37] Caro, G., Zur Bevölkerungsstatistik der Karolingerzeit, *Deutsche Geschichtsblätter* **5**: 195–202, 1904; Lot, F., Conjectures démographiques sur la France au IXe siécle, *Moyen Âge* **32**: 1–27, 109–137, 1921; Sée, H., Peut-on évaluer la population de l'ancienne France? *Rev. d'econ. pol.* **38**: 647–655, 1924; van Werveke, H., Die Volksdichte in 9. Jahrhundert, *30 Congres von het Ourheird en Geschiedkundig Verband van Belgie,* 1936; Franz, L., Die Erfassung der Bevölkerungsgrosse und Bevölkerungsdichte früheren Zeit, *Archiv für Landes- und Volksforschung* **2**: 404–416, 1938; Stoll, H., Bevölkerungszahlen aus frühgeschichtliche Zeit, *Die Welt als Geschichte* **8**: 69–74, 1942.

[38] de Beaurepaire, C., Recherches sur la population de la généralité et du diocese de Rouen avant 1789, *Mémoires,* Société des antiquaires de Normandie, **28**: 361–433, 1870.

[39] Garnier, J., *La recherche des feux en Bourgogne aux XIVe et XVe siècles,* Dijon, 1876.

[40] de Boislisle, A., La budget et la population de France sous Philippe de Valois, *Ann. Soc. Hist. France,* 86–94, 181–190, 191–207, 232–240, 1875; Thomas, L–J., La population de Bas-Languedoc, etc., *Annales du Midi,* 469–488, 1908; Estienne, J.,

Two full-length studies of French demographic history appeared within a few years of each other before the end of the century.[41] Both considered the whole history of the country and therefore could devote only a limited space to the medieval period. After all, the modern era offers much more information and is more significant if one is interested primarily in trends of the present. Levasseur devoted much attention to method, giving several pages to defining an index number for the hearth and eventually accepting four, a quite good choice. He believed that the 1328 document covered about half of France and thus came away with a population of 20–22 million. His work upon Gaul was not so happy and, while he did believe in a decline with the Black Death, he did not try to define it accurately.[42] In general, Schöne tried to reduce the estimate for 1328 by lowering the index: he noticed that even the hearths of widows were included.[43] Neither used local archives to any extent, and neither tackled the really critical problem of the extent of France included in the taxation returns of 1328.

The 1328 problem was considered by the late Professor Lot in one of several articles devoted to population.[44] In his long and distinguished scholarly career he touched upon many phases of late ancient and medieval history and literature. He believed that population developments were essential for understanding of history in its fullest sense. Indeed, he seems to have become more interested in it in his later years. Then he published three parts of his *Recherches sur le population et le superficie des cités remontant à la period Gallo-Romaine* in 1946–1950. He believed that the areas of cities bore a definite relationship to population but did not define it in his published work. Some recent study has been given to population in France.[45]

Early interest in population of Spain was not great. However, in the nineteenth century two remarkable works were published. In 1829 Thomas Gonzales, the archivist of Simancas, discovered some interesting demographic documents there and published a stout volume which included a great deal of sixteenth century information and some even from the fifteenth century.[46] It included the total population of the diocese of Seville and the city of Madrid for one tax which enabled him to select a very definite figure by which to multiply the *vecinos,* the unit appearing in most of the documents. Since he now had estimates for several dates he made a serious and successful effort to trace the trend of Castilian population. He found it to be declining from about 1482 to within the sixteenth century although the 1591–1594 census appeared to be out of line with the general trend. The second work was the publication of a fourteenth-century census of Catalonia.[47] More of these records are to be published.[48]

The information supplied by those works was largely the basis for the medieval section of two general works.[49] The extensive records of Barcelona have been used to indicate both numbers and vital statistics of the late medieval period.[50] A study of villages in the north provides excellent evidence for comparing such units as hearth and house.[51] Recently some fine articles have explained the special conditions of the Mohammedan cities in Spain and other studies upon repopulation and phases of migration are in print or are soon to appear.[52] The interest in population is thus quite deep.

4. NORTHERN EUROPE

Pirenne, in his notable article upon the population of Ypres,[53] stated that Karl Hegel had begun an epoch of population study with his discovery of the very full data upon the population of Nürnberg for the year 1446.[54] For the first time the total population of a medieval city was available. Furthermore, even important divisions of the civic people could be separated for numeration and study. It stimulated a long series of studies to be mentioned in the next paragraph. A second line of demographic study was commenced by Karl Lamprecht

Declaration des feux en 1469, *Bulletin de la Société des Antiquaires de Picardie* **34**: 95–137, 1931–1932.

[41] Levasseur, E., *La population française,* Paris, 1889; Schöne, L., *Histoire de la population française,* Paris, 1893.

[42] Levasseur, *op. cit.,* 59–64, 99–100.

[43] Schöne, *op. cit.,* 90.

[44] L'état des paroisses et des feux en 1328, *Bibl. Ec. Chartes* **90**: 51–107, 256–315, 1929. Others are: Rome et sa population à la fin du IIIe siècle de notre ère, *Annales d'histoire sociale* **7**: 29–38, 1945; Conjectures démographiques sur la France au IXe siècle, *Moyen Âge* **23**: 1 ff, 1921.

[45] Notably by students of Professor Wolff of Toulouse: Prat, G., Albi et la peste noire, *Annales du Midi* **64**: 18–25, 1952; Larenaudie, M-J., Les famines en Languedoc aux XIV^{e} et XV^{e} siècles, *ibid.* **64**: 27–39, 1952.

[46] Gonzalez, T., *Censo de población de las provincias e partidas de la corona de Castilla en el siglo XVI,* Madrid, 1829; Edge, P. G., Early population records in Spain, *Metron* **9** (3): 229–249, 1931–1932.

[47] Bofarull y Mascaro, P., *Censo de Cataluña ordenado en tiempo del rey Don Pedro el Ceremonioso,* Barcelona, 1856.

[48] Other hearth tax records are to be published by P. Javier Uranga.

[49] Garcia Barzallana, J., *La población de España,* Madrid, 1872. It devotes one chapter to the period before 1800; Fuentes Martianez, M., *Despoblación y repoblación en España, 1492–1920,* Madrid, 1929.

[50] Smith, R. S., Barcelona "bills of mortality" and population, 1457–1590, *Jour. Polit. Economy* **44**: 84–93, 1936; Fourteenth century population records of Catalonia, *Speculum* **19**: 494–501, 1944.

[51] Reglá Campistol, J., Cuestiones demográficas del Valle de Aran en la Edad Media, *Pirineos* **4**: 497–511, 1948; also in his *Francia, la Corona de Aragon y la frontera pirenaica* **2**: 391–394, Madrid, C.S.I.C., 1951.

[52] Torres Balbás, L., Los contornos de las ciudades hispanomusulmanas, *Al Andalus* **15**: 437–486, 1950; Estructura de las ciudades hispanomusulmanas: la medina, los arrabales y los barrios, *ibid.* **18**: 149–177, 1953; Extensión y demografía de las ciudades hispanomusulmanas, *Studia Islamica* **3**: 35–59, 1955. For other studies see the report by J. M. Lacarra, IX Hist. Congress, *Actes* **2**: 42–44.

[53] Pirenne, H., *Vjschr. f. Sozial- u. Wirtschaftsgesch.* **1**: 1–32, 1903.

[54] Hegel, K., *Chroniken der deutschen Städte* **2**: 500–513, Leipzig, 1864.

in his monograph upon the development of the villages of the Moselle region in the central period of the Middle Ages.[55] This meticulous study has apparently found few imitators.

German interest in population has flowered primarily in three periods: a long one from about 1879 to 1928 which concentrated upon the cities, a second in 1934–1944 which emphasized settlement and migration as the Nazis commenced that expansion which ended in their loss of German gains of a thousand years, and a recent turn to the study of the economic history of the later Middle Ages. The earliest period produced excellent studies of such cities as Basel, Frankfurt am Main, Nürnberg, Dresden, Münster in Westphalia, and Zürich.[56] Even under the Nazis such studies persisted.[57] The information about the cities enjoyed an excellent summary.[58]

Not until 1943 was a population history of Germany published,[59] and it essays little for total population. Appearing when it did, it naturally emphasized migration, a topic upon which many articles were written.[60] More recently the conditions of the end of the Middle Ages have attracted scholarly attention.[61] Many of these are regional rather than general. The chief reason for the lack of interest in country-wide study is that population data are largely derived from the archives of cities and thus are relatively local. This reflects the breakdown of central government in the twelfth and thirteenth centuries just before much data were compiled. The archival condition makes the study of total population in medieval Germany peculiarly difficult.

English records have survived in greater quantity than those of other nations with respect to demography as well as for other phases of history. Four great sources of such information survive: Domesday Book, Poll Tax of 1377, extents and inquisitions post mortem. With such a wealth of material some studies naturally resulted.[62] The publication by Topham of the totals in the enrollment of the 1377 poll tax led to their use and the general consensus of opinion that England's population at the time was about 2½ million.[63] This is probably the best evidence on a wide scale about population before the age of the modern census. The general introduction to Domesday Book by Henry Ellis was the second great advance in English population study. Here the estimates based upon his totals range from about 1,350,000 to 2 million.[64] What happened in between has been the subject of many guesses. The vast amount of evidence in the extents and inquisitions post mortem which could be used for tracing trends in population and for length of life was hardly used before the present writer studied them within recent years.[65] The Celtic portions of the islands are not so easy to study since their records are less.[66]

The chief English contribution recently seems to be an emphasis upon the relation of population change to movements of prices and wages, suggesting indeed that they move directly together. For instance, it is intimated that population in England must have begun to fall about 1330 because prices declined at that time.[67] It parallels a similar discussion of business depression at the end of the Middle Ages in Germany,[68] and predicates a long period of population stagnation in England at that time. The matter of prices and wages should

[55] Lamprecht, K., *Deutsches Wirtschaftsleben in Mittelalter* **1**: 150 ff; Leipzig, 1885; and his earlier work, *Wanderungen* **2**: 54.

[56] Schönberg, G., *Finanzverhältnisse der Stadt Basel in 14 und 15. Jahrhundert,* Tübingen, 1879; Bücher, K., *Die Bevölkerung von Frankfurt am Main,* Tübingen, 1886; Buömberger, F., *Bevölkerungs- und Vermögensstatistik in der Stadt und Landschaft Freiburg im Uchtland, Freiburger Geschichtsblätter* **6–7**, 1900; Ott, C., *Bevölkerungsstatistik in der Stadt und Landschaft Nürnberg,* Berlin, 1907; Richter, 273–289; Lethmote, F., *Die Bevölkerung Münsters in Westphalien* etc., *Münster Beiträge der Geschichtsforschung* **41**: 1912; Schnyder, W., *Die Bevölkerung der Stadt und Landschaft Zürich von 14. bis 17. Jahrhundert,* Zurich, 1928.

[57] Singer, E., Untersuchungen über die Bevölkerung Dortmunds in 15. Jahrhundert, *Beitrage zur Geschichte Dortmunds und die Grafschaft Mecklenburg* **42**: 85–130, 1936; Ammann, H., in *Festschrift F. E. Welti,* 390–447, Aargau, 1937; Harzendorf, F., Die Einwohnerzahl der Stadt Überlingen um 1500, *Zs. f. d. Gesch. d. Oberrheins* **52**: 188–193, 1939; Schreiber, Die Entwicklung der Augsburger Bevölkerung von Ende des 14, etc., *Archiv für Hygiene* **123**: 90–170, 1939.

[58] Jastrow, J., *Die Volkszahl deutscher Städte zu Ende des Mittelalters, Berlin,* 1886.

[59] Keyser, E., *Bevölkerungsgeschichte Deutschlands,* Leipzig, S. Hirzel, 1941.

[60] Such as: Keyser, E., *Geschichte des deutschen Weichsellandes,* Leipzig, 1939; Kothe, I., *Das mecklenburgische Landvolk in seiner bevölkerungs-biologische Entwicklung,* Leipzig, 1941; Tscharnke, H., Bevölkerungsgeschichte und Rassenforschung, *Archiv für Bevölkerungswissenschaft und Bevölkerungspolitik* **7**: 91–110, 1937.

[61] Abel, W., Bevölkerungsgang und Landwirtschaft in ausgehenden Mittelalter, *Schmoller's Jahrbuch* **58**: 33–62, 1934; Abel, W., *Die Wüstungen des ausgehenden Mittelalters,* Jena, G. Fischer, 1943; Ammann, H., Die Bevölkerung von Stadt und Landschaft Basels am Ausgang des Mittelalters, *Basler Zeitschrift* **49**: 25–52, 1950; Pohlendt, H., *Die Verbreitung der mittelalterlichen Wüstungen in Deutschland,* Göttingen, Gött. Selbtsverlag d. Geogr. Inst. 1950; Reincke, H., Bevölkerungsprobleme der Hansestädte, *Hansische Geschichtsblätter* **70**: 1–33, 1951. A general view appears in: Lütge, F., *Das 14–15.* Jahrhundert in der Social- und Wirtschaftsgeschichte, *Jahrbücher für Nationalökonomie und Statistik* **162**: 161–213, 1950.

[62] Russell, *BMP,* 6–14.

[63] Topham, J., Subsidy roll of 51 Edward III, *Archaeologia* **7**: 337–347, 1785. See Russell, *BMP,* 8–9.

[64] Ellis, H., *A general introduction to Domesday Book,* London, 1833; Russell, *BMP,* 10–12; Darby, H. C., *The Domesday geography of eastern England,* Cambridge, Cambridge Univ. Press, 1952. See notes at end of chapters for bibliography.

[65] Length of life in England, 1250–1348, *Human Biology* **9**: 528–541.

[66] Russell, *BMP,* ch. XII; Cooper, T. M., The numbers and distribution of the population of medieval Scotland, *Scottish Hist. Rev.* **26**: 2–9, 1947.

[67] Postan, M., Some evidence of declining population in the later Middle Ages, *Econ. Hist. Rev.* 2nd ser., **2**: 221–240, 1950.

[68] As, for instance, in Abel, *Die Wüstungen des ausgehenden Mittelalters,* Jena, 1943.

probably be considered along with such factors as the supply of gold and silver and the development of technology at the time.[69] It needs further exploration, but, at least, has had the effect of stimulating the interest of the economic historians in the subject of population.

The Low Countries have been fortunate both in the sources of their later medieval demography and in the extent of treatment and publication. Pirenne devoted a study to the population of Ypres of the period.[70] There have been studies of the districts of the region [71] which have placed most of the sources in print. The longest and most detailed discussion of sources was that of Cuvelier. He discussed at some length the problem of number to the house and also the proportion of population in the larger cities of the area.[72]

There has been some interest and notable work upon population among the smaller states, particularly in the northern part of Europe. One volume of *Nordisk Kultur*, a great collection about the Scandinavian countries, has been devoted to population.[73] In Denmark and Norway the special papal tax was apparently levied by houses and offers some help for the numbering of population.

5. PRESENT ATTITUDES TOWARD POPULATION STUDY

In reviewing the writings upon population one notices that there are certain general trends and conditions evident. The lack of interest in population in the Middle Ages carried over easily into the early modern period. This continued during the eighteenth century because such writers as Montesquieu found little in the subject to cause them to consider population a dynamic force. Even Malthus kept the subject in that state because he believed it the result of economic forces. Only at the very end of the nineteenth century did considerable interest appear as democracy made human statistics of significance and imperialism with balance of power politics showed the value of manpower.

Furthermore, interest in population history has been limited in effectiveness by lack of data for many periods and for many phases of the subject. Information about the Middle Ages before 1086 is very scarce. This field, thus, has not attracted much attention. Many areas of Europe are singularly lacking in information about population, especially eastern Europe even in the time of the Byzantine Empire. Similarly, data upon which length of life could be studied are very scarce. The long series of inquisitions post mortem of medieval England are almost unique except for casual Spanish and Italian evidence. The information about migration was somewhat greater but only in Germany did it arouse extensive interest beyond the period of the great migrations of peoples at the end of the Roman Empire of the west. Now unquestionably much may be added in the course of time. Archaeologists will certainly be able to estimate more accurately the size of cities and, if the relationship of size of city to total population of country proves valid, more estimates about total population will be available. It is doubtful whether many data about length of life appear since their value depends upon a considerable body of evidence, and masses of documents are not apt to escape attention. The material upon migration is vast and has been scarcely touched in this study. Information about population theory is badly scattered and will probably be collected and used only gradually.

The study of the writing upon population history shows two biases: one in favor of exaggerated estimates and the second a tendency to use the number five as the index for house, hearth, or family. The idea of a Golden Age in the past is very strong. This idea had hardly passed from vogue before the tremendous gains in population created another basis for presumption of great populations in the past. It must be a little difficult today for a citizen of a great city to visualize his city exerting an important influence in, let us say, the twelfth century with only a few thousand inhabitants. Much population history is local and subject to community patriotism which tends to exaggerate past greatness often unconsciously. For some reason the number five has a fascination for historians as the index number for family units. The writer thinks in terms of a man-wife-three children family, forgetting that this condition only lasts a few years in the career of families. As will be shown later, the man-wife-children unit was usually about 3.5. If others lived in the same house or there were exemptions, the index number might be larger. While the index number was occasionally five, it is not a "reasonable" figure. Since the index number was usually less than five, the use of that number merely aggravated the tendency to exaggerate population size.

[69] On money variations see: Hamilton, E. J., *Money, prices and wages in Valencia, Aragon and Navarre, 1351–1500*, Cambridge, Mass., 1936. For the other: White, Lynn, Jr., Technology and invention in the Middle Ages, *Speculum* **15**: 141–159, 1940.

[70] Pirenne, H., Les dénombrements de la population d'Ypres au XVe siècle, *Vjschr. f. Sozial- u. Wirtschaftsgesch.* **1**: 1–32, 1903.

[71] Hansay, A., Le "crenée" générale du pays de Liége en 1470, *C. R. d. séances de Comm. R. d'Hist* **71**: 67, 106, 1902; de Brouwere, J., Les dénombrements de la Châtellanie d'Audenarde, 1469–1801, *B. Comm. roy. d'Hist.* **103**: 523–546, 1908; Cuvelier, J., *Les dénombrements de foyers en Brabant*, Brussels, 1912; Grob. J., and J. Vannerus, *Dénombrements des feux des duché de Luxembourg et comté de Chiny*, Brussels, 1921; de Smet, J., Le dénombrement des foyers en Flandre en 1469, *B. Comm. roy, d'Hist.* **99**: 105–150, 1935; Vannerus, J., Dénombrements luxembourgeoises du XVe siècle, *ibid.* **106**: 237–314, 1941; Cuvelier, J., Contribution à l'histoire financière et démographique de Louvain au moyen âge, *ibid.* **108**: 1–61, 1943.

[72] Cuvelier, xlii–lxxxi and cclxxix.

[73] *Nordisk Kultur, Befolkning i Middelalderen*, Oslo, 1938. Christensen, A. E., Danmarks Befolkning oj Bebyggelse Middelalderen, 1–57; Johnsen, O. A., Norges Folk i Middelalderen, 58–105; Hornborg, E., Svenskarna i Finland och Estland, 106–122; Schück, A., Ur Sveriges Medeltida Befolkningshistoria, 123–166.

In spite of its handicaps and its faults the subject of late ancient and medieval population does have a vital interest for history. The early part of the period apparently experienced a long decline, almost the only one available for careful study. The extent of the decline needs to be defined before its effects can be estimated effectively. What were the effects upon society in its military, economic, social, and even religious interests? What were the population developments of the middle period? Did numbers descend lower before than after the Carolingian period? What happened during the Black Death of the fourteenth century? Can we assume that the same thing happened in the sixth century? How soon did Europe recover from the catastrophe of fourteenth–fifteenth-century plague? Now many of these topics are of particular interest to the economist and sociologist both directly and for their results. These scholars in turn have often stimulated the historians to take an interest in demography. It is not surprising that of recent years there has been increasing interest in demography.

The rise in interest in medieval population may be illustrated by the attention given the subject recently in two historical congresses. The Eighth at Zurich in 1938 saw only an extra section devoted to historical demography which paid some attention to Roman population but was really interested in modern phases of the subject.[74] In one of the sixteen regular sections (X, Economic and Social) two papers touched the subject: the first by J. H. Clapham on the "Domesday Survey of Yorkshire" and a second entitled "Decline of Population A.D. 200–700 and Its Intellectual and Social Results."[75]

In the Ninth International Congress at Paris in 1950 demography of the Middle Ages was much more prominent. The field of history was divided into seven parts of which the first was entitled "Anthropology and Demography." The medieval section was concerned almost entirely with population, the material being prepared by Professors Cipolla, Dhondt, Postan, and Wolff and organized as a report by the last named. The report was limited to western Europe and to the later Middle Ages except for a short treatment of the Carolingian period.[76] The long and interesting discussion of the report is summarized in the *Actes*.[77] The bibliographical treatment was on a high level and the problems presented so that they could be understood. At the end of the report was quoted Pirenne's suggestion that demography was possibly the most important of the social sciences, a quotation used also by Lot.[78]

II. THE FAMILY

Family meant much to the Middle Ages. It was a fundamental unit of society. The great families spent their lives extending their holdings, often by promising marriages. The burgess families usually ran the gild shops as family enterprises, and the gilds often constituted closely related family groups. Peasant families used all of their manpower resources, the men tilling the fields, the women spinning and carrying on the housework, and the children herding the animals while all of the family turned out to harvest the main crops. Despite evidence of family breakdown, family also meant much to the later Roman period. In both periods, as at all times, members of the ruling classes felt that ordinary rules of social conduct did not apply to them.

The data about the family involve the proportion of men to women, of married to unmarried, and adults to dependent children in the population. There is enough evidence to provide clues as to the status of marriage in the late Roman and medieval periods. If one is interested in the age grouping of the population, he should glance through the next chapter on expectation of life, examining carefully the life tables set out there. The evidence about the size of family is presented in chapter V where it is related to hearths and houses as units for study of population of cities and countries.

1. SEX RATIO

Sex ratio is usually defined as the number of men to each 100 women in a population. There is a scattering of information about it throughout the late Roman and medieval period. The normal ratio at birth is about 105. However, this declines with the greater mortality of males until most populations show about an equal number of men and women in the total. This assumes

TABLE 3

SEX RATIO, ROMAN

Area	Men	Women	Sex ratio
Africa	6,238	4,459	140
Iberia	1,111	885	126
Egypt	367	348	105
Italy	1,055	754	140
Rome	4,575	3,490	131

Sources: For Italy, Beloch, *BGRW*, 47; for others, Macdonell, W. R., On the expectation of life in ancient Rome, *Biometrika* **9**: 378–379, 1913; for Egypt, Hombert, M., et C. Préaux, *Recherches sur le recensement dans l'Égypte romaine*, 156, Leiden, E. J. Brill, 1952.

[74] This was the work of an external commission on comparative historical demography. *Actes de Congrès*, VIII Congrès International des Sciences Historiques, 426–436. For the work of this commission and of its sessions at Warsaw in 1933 see *Bull. Intern. Comm. Hist. Sciences* **5**: 594–595, 1933; **6**: 191, 1934; **7**: 116, 1935; **8**: 549–567, 1936.

[75] *Ibid.* **10**: 511–513, 1938 and 508–510, respectively. Also in VIII Congrès International des Sciences Historiques, Zurich, 1938, *Communications présentées* **2**: 355–357 and 352–354.

[76] *Rapports* **1**: 58–80. Some demographic material appears also in the economic report. *Ibid.*, 227–229.

[77] *Actes* **2**: 31–44.

[78] *Actes* **1**: 80; Lot, *Recherches*, vii.

TABLE 4

ROMAN SEX RATIO, SELECTED AGE GROUPS

Place	All	Above age 20	Above age 40
Iberia	117	134	166
Africa	102	110	115
Rome	93	112	156

that there has been no extensive migration in and out of the areas. Usually migration tends to take more women than men from the countryside to the cities. Given a normal proportion of men and women in the total population of a country, there should be more women than men in the city and the reverse in the country districts. If there are marked divergences from the normal, some tampering with human life is to be suspected.

Roman data show a heavy preponderance of memorials to men upon the tomb inscriptions. Perhaps this is partly a result of greater survival of wives (who showed their affection by funeral monuments) than of husbands. Married life in the case of some 384 inscriptions lasted on the average about twenty-four years.[1] Men married at about twenty six and girls at about eighteen.[2] Given reasonably equal expectation of life, there should have been a considerable survival of widows. Nevertheless, the very high sex ratio can hardly be explained in such terms especially since the condition continued into the Middle Ages, as we shall see. Exposure of childen was a common practice then. Perhaps the best known instance is the advice given by a man to a relative in Egypt to expose the coming child if it is a girl but to keep it if a boy.[3] The data for several parts of the Empire are given in table 3.

However, when checks are made upon the effect of the mortality rates upon men and women there is the possibility of another explanation. If one assumes that the number of males and females is the same at birth, the sex ratio would be as shown in table 4 for three areas in the Empire for the whole population; for all, above twenty, and for all above forty. If the data on the inscriptions do describe the situation accurately, the female death rate was greater at nearly all ages except some of the higher and was particularly high for the period between fifteen and forty. The high African sex ratio might be the result of emigration to other areas. Unfortunately, no breakdown for sex has been made for the eastern half of the empire. Beloch's data on the districts of Italy show a much higher death rate for women and thus conforms to the Iberian data.

The polyptyques and other documents of the Carolingian age also give much information on this subject. The Polyptyque d'Irminon shows a sex ratio of 132 (2,438 males to 1,842 females) in sixteen villages belonging to St. Germain des Prés about Paris in the

[1] Harkness, A. G., Age at marriage and at death in the Roman Empire, *Trans. Amer. Philol. Assoc.* **27**: 49, 1896.

[2] Harkness, *op. cit.*, 35–72.

[3] Frank, *ESAR* **2**: 278, 281.

TABLE 5

DISTRIBUTION BY SEX AND MARRIAGE STATUS, VILLAGES NEAR PARIS, EARLY NINTH CENTURY

Village	Adults		Married couples	Unmarried		Children			Totals		
	Male	Female		Male	Female	Male	Female	Sex uncertain	Male	Female	Both
Béconcelle	136	116	108	28	6	116	116	—	252	232	484
Bitry-les-Mallons	18	16	15	3	1	27	15	—	45	31	76
Celle-les-Bordes	83	53	53	30	—	75	64	—	158	117	275
Chavannes	26	27	20	6	7	28	20	—	54	47	101
Épinay-sur Orge	66	56	47	19	9	40	46	41	106	102	249
Gagny	37	30	27	10	2	35	17	4	72	47	123
Gaugiaco	41	19	13	28	3	16	15	7	57	34	98
Le Coudray	20	14	13	7	1	6	8	2	26	22	50
Maule-le-Buat	89	78	74	16	4	116	94	—	205	172	377
Morsan-sur-Seine	50	39	36	13	1	32	37	2	82	76	160
Nogent l'Artaud	39	34	27	12	7	41	31	—	80	65	145
Palaiseau	174	132	120	54	12	190	148	—	364	280	644
St. Germain le Secqueval	119	106	101	18	5	164	116	—	283	222	505
Thiais	150	122	106	44	14	108	80	90	258	202	550
Verrières	135	94	77	58	17	7	2	226	146	96	464
Villeneuve St. George	139	122	97	42	25	111	75	31	250	197	472
Total									2,438	1,942	4,773

Source: *Polyptyque de l'Abbe Irminon*, ed. Guerard, **2**: Béconcelle 245–270, Bitry-les-Mallons 117–118, Celle-des-Bordes 24–32, Chavannes 241–244, Épinay-sur-Orge 52–59, Gagny 33–37, Gaugiaco (modern name unidentified) 1–5, Le Coudray 197–198, Maule-le-Buat 214–226, Morsan-sur-Seine 60–69, Nogent l'Artaud 70–75, Palaiseau 6–23, St. Germain le Secqueval 227–240, Thiais 151–164, Verrières 38–51, Villeneuve St. George 165–178.

TABLE 6

DISTRIBUTION BY SEX AND MARRIAGE STATUS, EARLY GERMAN DATA

Source	Married couples	Children of married couples	Unmarried			Servants, sex unstated
			Men	Women	Children	
Trad. Fulden. c.48–54						
Lidi de loco Frechenleba	64	203	41	20	44	19
Lidi de Scegenstete	38	101	20	7	43	—
Familia S. Bonifacii in Rotenwilere	12	25	5	—	3	—
Lidi de Anere	30	78	26	7	27	5
Servi de Anere	22	50	11	3	5	18
Familia de Waleheslebe	4	13	5	1	4	12
Familia de Tunnage	9	18	7	2	4	3
Familia de Bruocheim	17	30	7	1	3	5
Trad. Wizzemb. 774 n. 61	2	6	3	3	4	—
Trad. Wizzemb. 774 n. 63	24	17	16	14	1	—
Trad. Wizzemb. 774 n. 67	3	9	22	18	7	—
Trad. Wizzemb. 774 n. 71	5	7	7	8	11	3
Trad. Wizzemb. 774 n. 73	4	5	1	1	—	2
Trad. Wizzemb. 797 n. 62	5	13	18	11	20	—
Cod. Fuld. 757–823 (16 Urkunden)	21	52	21	28	55	—
Meichelb. 774 and 777 n. 43.51.	11	21	5	3	6	—
Mittelrh.U.B.I 41.	14	54	15	14	72	—
Ried cod. Ratisb. 821 n. 18	17	22	3	2	—	4
Mittelrh. U.B. 826 I 58	16	58	11	9	24	4
Mittelrh. U.B. 855 I 199	8	19	6	7	12	—
	326	801	250	159	345	75

Total adults: 1,136
Total children: 1,146
Source: von Inama-Sternegg, K. T., *Deutsche Wirtschaftgeschichte* 1: 514, 1879.

early part of the ninth century.[4] These villages show some variation in proportions of men and women. Presumably economic opportunities were more attractive in some villages than in others. The evidence from the polyptyques of St. Victor of Marseilles and of St. Remi of Reims is not so clear. The data are offered in a way which leaves it uncertain whether all persons are included. However, even here it would seem that men outnumbered women.[5] Two collections of names of serfs from charters of Fulda show a ratio of about 115 for the years 750–797 and of about 107 for a period after A.D.[6] 850. A village given to the cathedral of Amiens in the ninth century had 95 adult men and 74 adult women.[7] It would seem that in ninth-century France there was a heavy preponderance of men. Scattered German evidence shows the same condition.[8]

The information about sex ratio from medieval Britain is fairly extensive. The largest source is the information from the inquisitions post mortem which run into the thousands from the thirteenth century onwards. For a time at the beginning, the number of men and women appear to be approximately the same. However, during the first half of the fourteenth century the sex ratio rises until it has reached about 133 or about four men to each three women.[9] For a time during the plague the numbers of the sexes are about the same but

TABLE 7

SIZE OF MURDERED FAMILIES, THIRTEENTH-CENTURY ENGLAND

Years	Cases	Adults		Children		Sex not stated	Total	Average to family
		M.	F.	M.	F.			
1218–1222	12	10	10	6	11	7	44	3.7
1266–1276	10	14	5	1	6	2	28	2.8

Total adults: 39 Total male: 31
Total children: 24 Total female: 32
Uncertain: 9 Uncertain: 9

Sources: Later examples are from Gross, C., *Select cases from the coroners' rolls, 1265–1413*, 4–34, London, Selden Soc. 1896, and the earlier from Stenton, D. M., *Rolls of the justices in Eyre*, 537–600, London, Selden Soc., 1934. The suggestion that these be used was made by Dr. E. B. Fryde, University College, Aberystwyth, Wales.

[4] The information comes from table 5 drawn from Guérard's edition of that polyptyque.

[5] For St. Victor see table 32. At Curtis Agutior (pages 47 to 49, col. 1) there were 232 men to 168. Guérard, B., *Polyptyque de l'Abbaye de Saint-Remi de Reims*, Paris, 1853.

[6] Dronke, E. F. J., *Codex Diplomaticus Fuldensis*, 7–78, 251–271, Cassel, 1930.

[7] Lot, F., La grandeur des fiscs à l'époque carolingienne, *R. belge de Philol. et d'Hist.* 3: 55, 1924.

[8] See table 6.

[9] Russell, *BMP*, 149 and 240.

TABLE 8

SEX RATIO, FIFTEENTH CENTURY GERMAN CITIES

Place and Date	Sex ratio
Basel, 1454	93
Bautzen (knechten and mädchen)	79
Dresden	105
Frankfort am Main, 1385	91
Freiburg-im-Üchtland 1444–1448	82–3
Mecklenburg, 3 bourgades	81,92,98
Neuenberg im Rheintal	113
Nürnberg, 1449	84
Überlingen, *ca.* 1500	88
Ypres, 1506 (part)	83
Zurich, 1467	139

Sources: Basel, counted from Schönberg, G., *Finanzverhältnisse der Stadt Basel im 14 und 15 Jahrhundert*, 721–745, Tübingen, 1879; Bautzen, Jautwauk, J., *Die Bevölkerungs- und Vermögensverhältnisse der Stadt Bautzen au Anfang des 15. Jahrhundert*, 18–19, Bautzen, 1912; Dresden, Richter, 273–289; Freiburg-im-Üchtland, Buömberger, F., *Bevölkerungs- und Vermögenstatistik in der Stadt und Landschaft Freiburg (im Üchtland)*, 43, Freiburg i.U., 1900; Mecklenburg, Stuhr, F., *Die Bevölkerung Mecklenburgs am Ausgang des Mittelalters*, Mecklenburg, 1893; Neuenberg im Rheintal, von Inama-Sternegg, K. T., *Deutsche Wirtschaftgeschichte* **3** (1):428 (adults); Überlingen, Harzendorf, F., Die Einwohnerzahl der Stadt Überlingen um 1500, *Zs. f. d. Gesch. d. Oberrheins*, N.S. **52**: 112, 1929; for the others see Keyser, *BD*, 281 and IX Hist. Congres, *Rapports* **1**:71.

the sex ratio rises again during the fifteenth century.[10] Of course this information comes primarily from the wealthier classes of Britain. Even during the plague a sample of serf population appears with a ratio of about 170.[11] There is even some evidence about other ordinary people of the land.

For the thirteenth century some information is available in the English legal records, particularly the coroners' inquests and the presentments to the royal judges. In a number of cases whole families were destroyed by brutal thieves (family butchers?). In other cases the numbers of the family are disclosed in narrating the story of struggles within the house. Two series give enough data to make a statement worth while, one for the period 1218–1222 and a second for the years 1266–1276 (table 7). Of course the cases may be unrepresentative. The earlier list would seem to offer a normal average for families, but the second would seem too low, particularly with respect to number of children.

Giovanni Villani preserves some interesting information about fourteenth-century baptisms at the Cathedral in Florence. There it was the custom each year to put into a chest a black bean for each boy baptized and a white one for each girl. Villani says that each year there were between 5,800 and 6,000 baptisms and of these there were 300 to 500 more boys than girls. This would be a sex ratio of about 115.[12] After 1451 the record of baptisms at Florence was kept very carefully. These show a consistent sex ratio of 103.5–105, the normal ratio. For the years 1499–1533 the sex ratio at Arezzo was about 111. After that time it settles to a normal 103. As late as 1489 Pozzuoli had 1,395 men to 1,133 women, a ratio of 123, while even in the fifteenth century the ratio at Siena was as low as 105. It would seem then that the ratio became normal at the end of the fifteenth century in Italy.[13]

The cities of northern Europe, for the most part, show a predominance of women in the fifteenth century. This is the normal condition of urban population unless influenced by some unusual circumstance.[14]

The difference in sex ratio between city and countryside is shown rather strikingly by figures which have come from Nürnberg in 1449. In that year as a result of a siege many of the farmers of the countryside were in the city. The count is apparently a nearly complete survey of the inhabitants at the time (table 9). The difference for both the city and the countryside is thus about 450. However, a large proportion of the clerical population and probably of the extras were male so that the number of the sexes was probably about equal. It

TABLE 9

POPULATION OF NÜRNBERG, 1449

Classification	City			Countryside		
	Men	Women	Uncertain	Men	Women	Uncertain
Total	5,214	5,931	6,172	2,947	2,695	4,424
Burgesses	3,753	4,363				
Farmers				2,616	2,301	
Servants, etc.	1,461	1,568		331	394	
Children			6,172			4,424

Total in table above	17,317
Clerical	446
Jews	150
Extra	1,986

City 19,899 Country 10,066

Sex ratio for adults and servants

	Male	Female	Total	Sex ratio
City	5,214	5,931	11,145	88
Countryside	2,947	2,695	5,642	109
Total	8,161	8,626	16,787	95

Source: Jastrow, J., *Die Volkszahl deutschen Städte zu Ende des Mittelalters*, 185, Berlin, 1886.

[10] Russell, *BMP*, 149 and 241–242.
[11] Russell, *BMP*, 168.
[12] The data are from Beloch, *BI* **1**: 10; **2**: 119. Giovanni Villani, XI, 93.
[13] See Beloch, *BI* **1**: 10 ff.
[14] See table 8.

TABLE 10

DISTRIBUTION OF POPULATION (14 YEARS AND OLDER) BY SEX AND MARITAL STATUS, ENGLISH SITES, 1377

Area or Place	Ratio of men to women	Number of			Percentage married		
		Men	Women	Married couples	Men	Women	Both
Places with							
1–25 inhabitants	1.11	38	36	31	81.6	86.1	83.7
26–50 inhabitants	1.08	233	212	158	67.8	74.5	71.0
51–100 inhabitants	1.01	381	377	280	73.5	74.3	73.9
101–200 inhabitants	.99	669	678	476	71.2	70.2	70.7
201–400	.99	692	665	455	65.8	68.4	67.1
759,[a] Dartmouth				173			68.4
1,017, Carlisle	.95	331	347	194	58.6	55.9	57.2
2,336, Kingston on Hull	.93	745	805	448	60.1	55.7	57.8
4,432, Colchester[b]	.95	1,420	1,490	883	62.2	59.3	60.7

[a] Dartmouth. The unmarried include 104 servants (sex unstated) plus 20 men and 36 women unmarried for a total of 160. It is assumed that the servants were unmarried: in a few cases it may not be true.

[b] The sex of 45 persons is unknown. They were apparently unmarried.

Source: Russell, *BMP*, 155.

is unfortunate that information about sex of the children was not secured.

The sex ratio may have varied by size of population of places, being higher in the smaller places. A sampling from the poll tax lists of 1377 would indicate this (table 10) even though the largest borough involved, Colchester with its population of 4,432 was not much more than a county seat. Small parts of London, York, Oxford, and Rochester show high sex ratios.[15] In the period of the plague the sex ratio was about 100. Since for most of the time it was well above 100, this relationship may not have held for other times. However, the low sex ratio of cities is true of most modern countries. The German cities usually have a low sex ratio while in at least one case the country ratio is high,[16] and the villages of the Tirol had a ratio of 112 (table 11).

[15] Russell, *BMP*, 155.

2. MARRIAGE

Vital statistics were not collected regularly even at the end of the Middle Ages. There is evidence about the age at marriage from Roman times and at the end of the period. Some of the surveys of persons enable one to discover the percentage of those who were married. A rough estimate drawn from one set of these data can be used to make an estimate of the other. The percentage of the total population married is the

[16] For high country ratio, see Buömberger, F., *Bevölkerungs- und Vermögensstatistik in der Stadt und Landschaft Freiburg im Üchtland*, 70, Freiburg, 1900.

TABLE 11

DEMOGRAPHIC DISTRIBUTION OF TYROLESE VILLAGES, 1427

Place	Units hearths	Total	Average	Male	Married couples	Female	Children	
							Male	Female
Rettenberg	243	1,005	4.1	171	171	171	309	294
Rum	40	168	4.2	39	33	34	53	44
Leutasch	55	229	4.2	48	45	46	83	46
Ried im Oberintal	47	131	2.8	41	35	36	27	22
Kaünertal	87	375	4.3	73	67	72	117	102
Tösens in O.	16	47	2.9	13	11	12	11	11
Vendels	19	82	4.3	19	19	19	29	15
Partschins b. M.	140	555	4.0	120	118	120	159	131
Stain u.L.	342	1,097	3.2	319	256	257	231	227
Total	989	2,689	3.7	844	755	767	1,019	892

Sex ratio: 112

Per cent married: 42.9

Source: *Quellen zur Steuer-, Bevölkerung- und Sippengeschichte des Landes Tirol im 13, 14 und 15 Jahrhundert*, 9–10, Innsbruck, 1939, a Festschrift in honor of the eightieth birthday of O. Redlich.

index used for comparison. We assume that the percentage of those living together out of wedlock was relatively low and therefore can be discounted.

A calculation has been made upon the basis of over 300 funeral inscriptions that Roman men married on the average at about twenty-six and women at about eighteen.[17] Using these figures with the information from the Roman life tables, one may estimate the percentage of Romans who could have been married. The figure will be then a maximum. The evidence will deal with the more prosperous persons in the empire, of course, although some inscriptions concern slaves. We assume that the sex ratio was about 130. Of the 100 women some 55 would probably be over the age of eighteen and thus potential wives. However, of the 130 men only about 45–50 would be on the average above the age of twenty-five. Since monogamy existed we cannot assume over 45–50 of the 100 women possibly married. The percentage of possible married would then be $\frac{2\ (45-50)}{230}$ and the percentage would run from about 39 to 44. Actually, the prevalence of celibacy and slavery would tend to reduce the average beyond that produced by those who normally would not marry. On the other hand it is possible that the country people (particularly the men) married earlier.

The polyptyques of the seventh-ninth centuries give direct information about the percentage of married persons in the total population. A very small sample from the *coloni* of St. Lorenzo d'Oulx (north Italy) of the middle of the seventh century shows 40 married in a population of about 89 or about 45 per cent. However, the widows and the very old seem to be omitted since none appear and the percentage of children is high. If the children, who number 40, are actually under fourteen years we should expect them to be one-third of a population which would number about 120, of which the 40 married would then be a third; this seems probable.[18] The villages belonging to St. Germain des Prés show about 1,878 married persons in a total population of about 4,280. The percentage was thus about 43.9. The information from the Abbey of St. Remi of Reims is not so clear but the following seems to hold for one place:[19]

Men	234	
Women without children	49	168
Women with children	119	
Children	309	
	711	

If it can be assumed that all women with children were married and that none of the others were (rather unlikely), the total married was about 33.4 per cent. This, of course, is very low but the married folk among the serfs of St. Victor of Marseilles seem to be about 31.9 per cent of the total.[20] The ninth-century German data would show about 2,282 persons with 652 married, a percentage of only 28.6.[21] These percentages, with the exception of those of St. Germain, are so low that it may be doubted whether the population was maintaining itself.

The English poll tax of 1377 gives some information about the married part of the population at that time. Like the sex ratio, the percentage of the married varied somewhat according to the size of places. There was a higher percentage of persons married in the smaller places.[22] The highest percentage registered was in some small villages of Northumberland where 83.7 per cent of those over fourteen would appear to have been married. This would be about 55 per cent of the total population. It is possible that some of the unmarried may have avoided paying the poll tax here. In general the number of married seems to fall between 38 and 50 per cent of the total. The average number of the married would seem to be considerably higher than for the ninth century. However, this was in the plague period. The plague was notably devastating upon the older people who would normally have included a number of older single or widowed persons. Their deaths would have reduced the average number of the unmarried.

The information from the fifteenth century is not as abundant as one knowing the large amount of demographic information of the period would expect. Furthermore, for two places information is available only about a part of a city. In general the heaviest populated area was the center of a medieval city while smaller houses were on the edge. The marriage rate might thus vary somewhat from area to area. Why should a part of Dresden have so much higher a percentage of married persons than a part of Ypres or all of Basel? The percentages are:[23]

Basel, 1454	32.8
Dresden, 1430 (part)	49.3
Freiburg-i-Ü.	38.7
Tirol, 1427	42.9
Ypres, 1431 (part)	34.6

The age at marriage seems to have been relatively but not sensationally low in the late Roman and medieval period. In general it tended to rise from the early medieval to the middle period. It can be seen

[17] See table 12.

[18] For San Lorenzo see Troya, C., *Codice diplomatico Langobardo dal 568 al 774* **2**: 495 (no. 321), Naples, 1854. For St. Germain see table 5.

[19] Guérard, B., *Polyptyque de l'Abbaye de Saint-Remi de Reims*, 44–49, Paris, 1853.

[20] See table 32.

[21] See table 6.

[22] See table 10.

[23] Basel: Schönberg, G., *Finanzverhältnisse der Stadt Basels im 14. und 15. Jahrhundert*, 721–745, Tübingen, 1879. That is, 327 married couples, 291 men, 343 women, total 1288. One-third allowed for children. Dresden: Richter **2**: 273–289, esp. 279, 1881. Freiburg-im-Üchtland: see note 16 above, 59. Tirol, see table 11. Ypres: Pirenne, H., Les dénombrements de la population d'Ypres au XVe siècle (1412–1506), *Vierteljahrschrift für Social und Wirtschaftsgeschichte* **1**: 17, 1903.

TABLE 12

AGE AT MARRIAGE, ROMAN AND LATE MEDIEVAL

Age Interval	Roman		European Noble W.	England (Women)					
	M.	W.		Ed. I–Ed. II		Ed. III		Hen. VII	
				Mar.	Unm.	Mar.	Unm.	Mar.	Unm.
10–14	0	67	27	3	50	10	48	6	27
15–19	20	60	152	23	42	30	49	31	14
20–24	29	26	93	60	58	54	18	27	7
25–29	18	7	39	40	7	34	12	25	1
30–34	13	8	12	52	16	34	12	26	6
35–39	7	2	4	35	14	24	17	50	3
40–44	4		4						
45–49	2								
50–54	2								
55–59	1	1							
60–64	1								
Average age	26	18	20.1	20–24		*Ca.* 20		15–19	

Sources: Roman, Harkness, 35–72; European noble women, 1500–1599, Peller, S., Studies in mortality since the Renaissance, *Bull. Hist. Med.* **13**: 428, 1943; England, Russell, *BMP*, 157–158.

from table 12 that while many Roman girls were married by fifteen, the girls of the end of thirteenth-century England, at least of the wealthier classes, were married later. However, the English data are not of the time of actual marriages but of the age when the women appear married. There may thus be set up a small lag in years as a result. It is interesting also to notice that in the later Middle Ages the age of marriage in England actually became younger. The nobles on the continent seem to have kept the average age at about twenty. A little information from an English village at the end of the sixteenth century shows an average marriage age of 27.6 for men and 24.5 for women.[24] It is possible that the marriage age of the peasant classes was higher than for the wealthier groups—the low percentage of the married among the serfs might indicate that this was so.

3. BIRTH RATE AND FERTILITY

Fertility is the number of children that families actually have in the course of existence of a family. Birth rate is usually defined as the number of children each year to each hundred of the population: it is then a per cent. Fecundity is the number of children that a family might have, given no check upon its reproduction. As we have seen, the proportion of the group which is married varied in the Middle Ages from about 30 to 50 per cent of the population. The relationship varied from time to time and from one social class to another in the period. There is the statement that the birth rate of the period of the eleventh–thirteenth centuries was 4.2 per cent with a death rate of 3.6 while in the fourteenth–fifteenth centuries the birth rate was 3.9 while the death rate was 4.1.[25] These obviously would produce an increased population in the former period and a decline in the second.

Now a modern study has shown that the Italian family of today (one husband, one wife) can have on the average (if no restraints exist) about eight children or a child about once every twenty-nine months for a period of nearly twenty years. The infertile couples number about 10 per cent of the married families.[26] By using a life table it is possible to set up hypothetical limits of medieval groups if we assume (1) the pattern above is a normal pattern and (2) there were no restraints upon reproduction within families in the Middle Ages. From the life tables it is clear that the number of women of about twenty–forty years of age is about one-third of the total number of women. We calculate for society with sex ratios of 130 and of 100 since both types appear in the medieval period.

The problem is to determine the percentage birth rate possible. The percentage for each childbearing woman for a year is 41, that is 12 divided by 29 since the birth rate is at the rate of one child each 29 months. Now since only a third of the women are in the childbearing age, they constitute about 16.7 per cent of the total population. The maximum birth rate then, even for a society with a sex ratio of 100, would be 16.7 times .41 or 6.9 per cent a year. Since about a tenth of married couples are infertile this should be reduced to 6.2. Furthermore, in a society with a 130 sex ratio the number of females would be reduced to 43.5 per cent of the total population and the birth rates of the society to about 6 and 5.4 respectively. These are not very high.

However, if only 30 per cent of the society were married, the number of women at a maximum in the population would be 15, assuming a 100 sex ratio. If any of the married were beyond the childbearing age, the birth rate would be reduced proportionately. Unfortunately, the data are not available to determine just what percentage would be above the childbearing age.

A recent interesting article gives many data about the number and sex of children born to the French nobility in the later Middle Ages.[27] As the data stand the sex ratio is 162, about the highest sex ratio yet discovered. Men undoubtedly appear more frequently in the sources than women, so a part of the male excess is the result of selectivity of these sources. The high sex ratio is so typical of the period that a part of the difference in sexes is probably due to infanticide. The data are interesting chiefly in that, assuming a hypothetical birth rate based upon twice the number of males, they

[24] North Elmham. Morrell, C. C., Tudor marriages and infantile mortality, *Jour. State Medicine* **43**: 173–181, 1935.

[25] Abel, W., *Die Wüstungen des ausgehended Mittelalters*, 69, Jena, Fischer, 1943.

[26] Livi, L. *Trattato di demografia* **3**: 175, Padua, 1941. The per cent of live births, Italy, 1931, to each 100 women ran: 15–19 years of age 1.77; 20–24, 12.47; 25–29, 17.28; 30–34, 15.36; 35–39, 11.50; 40–44, 5.35; 45–49, .63.

[27] Feuchère, P., La noblesse du Nord de la France, *Annales* **6**: 306–318, 1951.

give some indication of the fertility under medieval conditions. It would seem then that the top for fertility would be on the average about eight. There is one case in the second half of the thirteenth century where one marital effort produced twenty-two children, so many that it raised the average for that half-century in our figures markedly. To these may be added some information about two Namur families.[28]

Some indications of the number of children can be secured by comparing the number of persons in the succession of generations in table 14 with the survivors of persons in the life tables at about twenty-two years, the average age of succession to inheritance. It will be noticed that, in general, the English average is less than the French. This is to be expected since the English data included succession to all marriages whether childless or not. It can be seen that the top of the French limit is a little higher than the English. Now the highest fertility would seem to be that of the Poles at the end of Middle Ages when their nobility had an average of about ten to the family.[29] However, if one subtracts the childless families, nearly a fifth, the average comes down to about eight to the family.

For southern France in the eleventh century there are some interesting data among the wealthy donors to the abbey of St. Victor of Marseilles.[30]

TABLE 13

NUMBER OF CHILDREN OF FRENCH NOBILITY, LATER MIDDLE AGES

Half century	Number of families	M.	F.	Total	Average	Hypothetical average
*Tenth, all	5	10	9+	19	3.8	4.0
*Eleventh, 1st	6	16	9	25	4.2	5.3
*Eleventh, 2nd	10	25	13	38	3.8	5.0
Twelfth, 1st	16	58	30	88	5.5	7.3
Twelfth, 2nd	18	60	40	100	5.6	6.7
Thirteenth, 1st	21	66	37	103	4.9	6.3
Thirteenth, 2nd	19	61	35	96	5.1	6.4
*Thirteenth, (except one)	18	51	23	74	4.1	5.7
Fourteenth, 1st	15	29	26	55	3.7	3.9
Fourteenth, 2nd	18	30	21	51	2.8	3.3
Fifteenth, 1st	9	28	15	43	4.8	6.2
Fifteenth, 2nd	9	21	12	33	3.7	4.7
Sixteenth, 1st	8	27	19	46	5.8	6.7
Total 12 to 16 centuries	133	380	235	615		
Rumigny-Florennes	8	24	22	46	5.8	6.
Walcourt	11	31	15	46	4.2	5.6

* Not counted in total.

Sources: Fouchère, P., La noblesse du Nord de la France, *Annales* **6**: 315–318, 1951; Genicot, *op. cit.* 67.

TABLE 14

ESTIMATE OF NUMBER OF CHILDREN TO FAMILY, ENGLAND, LATER MEDIEVAL PERIOD

Succession of generations		Surviving to age 22 (average age of inheritance)		Estimate of number of children to family	
Date	Number of children surviving (*a*)	Date and table number	Percentage (*b*)	(*a*)/(*b*)	Corrected to sex ratio of 115
To 1300	3.06	To 1276(8.3)	65.7	4.7	5.4
1301–1348	2.61	1276–1300(8.4)	60.9	4.3	4.9
1301–1348	2.61	1301–1325(8.5)	60.2	4.3	4.9
1348–1400	1.50	1326–1348(8.6)	54.2		
1348–1400	1.50	1348–1375(8.7)	29.6	5.1	
1401–1430	1.37	1376–1400(8.8)	36.9	3.7	
1401–1430	1.37	1401–1425(8.9)	38.3	3.6	
1431–1500	2.45	1401–1425(8.9)	38.3	6.4	
1431–1500	2.45	1426–1450(8.10)	61.1	4.1	4.7
1486–1505	3.09	1426–1450(8.10)	61.1	5.1	5.9

The life table numbers (*a*) in table 14 come from Russell, *BMP*, 244–245, and represent the number of children who survive their father. The average age of the eldest male heir was about twenty-two: presumably it would be about the same for female children surviving and would not be much less for all heirs since they seldom averaged in number over three.

The percentage who survive to age twenty-two are given in (*b*). They are taken from Russell, *BMP*, tables 8.3–10 from the l_x column.

The last two columns give the apparent number of children for each family, assuming first an equal birth rate and equal survival and second equal birth rate but survival of 115 males to 100 females.

Married couples	17	Sons	49
Men	14	Daughters	6
Women	14		
	45		

The data show nearly three live sons to the family, since most of the men and women are single. It is probable that daughters do not appear more frequently because they usually did not inherit if they had brothers. It would clearly seem that with possibly five or more live children to the family, these families were increasing in numbers. On the other hand the data from the serf population show a quite different situation.[31] There the number of persons under twelve would seem to be only about 21 per cent. If thirty-six of uncertain status

[28] Genicot, L., *L'économie rurale Namuroise au bas moyen âge*, 66–67, Louvain, 1943.

[29] Vielrose, E., A contribution to the vital statistics of the ancient Polish gentry, *Przeglad Statystyczny* **1**: 342, 1938 (summary in English).

[30] Guérard, B., *Cartulaire de l'Abbaye de Saint-Victor de Marseille* **1**: 374–429, Paris, 1857.

[31] See table 32. Twenty-six per cent would be about the proper figure, but it is improbable that these *filii* and *filie* would all be under twelve when the age of those under twelve is usually given.

TABLE 15

BIRTH RATE, SPECIFIED PLACES, FIFTEENTH-CENTURY ITALY AND SPAIN

Place	Year	Population	Years	Average births	Birth rate per cent
Florence	1470	40,323	1461–1470	2,461	6.1
Florence	1470	40,323	1471–1480	2,515	6.2
Florence	1551	59,557	1551–1570	2,619	4.4
Florence	1562	64,289	1551–1570	2,619	4.1
Siena	1569	19,640	1565–1574	857	4.4
Parma	1509	19,034	1501–1514	916	4.8
Modena	1581	18,001	1575–1587	793	4.4
Bologna	1581	70,661	1580	3,400	4.7
Genoa	1581				3.7
Genoa	1597	62,000			3.86
Palermo	1606	104,983	1600–1609	4,041	3.8
Arezzo	1551				5.6
Barcelona		40,000?	1457	1,121	2.8
Barcelona		30,000?	1483	998	3.3
Barcelona		30,000?	1489–1490	1,580	5.3
Barcelona		30,000?	1494	1,380	4.4
Barcelona		30,000?	1497	1,256	4.1
Barcelona		30,000?	1501	1,619	5.3
Barcelona		40,000	1520	1,916	4.8
Barcelona		40,000	1530	1,354	3.4

Sources: Genoa, Felloni, G., Per la storia della popolazione di Genova nei secoli XVI e XVII, *Archivio Storico Italiano* **110**: 242, 1952; other Italian cities, Beloch, *BI* **1**: 60–63; Barcelona, Smith, R. S., Barcelona "bills of mortality" and population, 1457–1590, *Jour. Pol. Econ.* **44**: 84–93, 1936, esp. pp. 91.

are added the total rises to about 26 per cent. It is thus very unlikely that the serf population was increasing in the ninth century.

Toward the end of the Middle Ages there is some information about baptisms in Florence, Italy, and Barcelona, Spain. The fifteenth-century figures for Florence apparently include babies brought into the city from the countryside. Since the city and its contado probably numbered about 62,000 in 1470 [32] this would bring the apparent birth rate down from the very high 6.1 per cent to about 4.0 per cent which is in line with other information upon the subject, but of the next century. The figures for Barcelona were presented during periods of plague to reassure the people that they were not all dying. They represent reports only upon certain days of the year adjusted to a yearly basis. Furthermore, since the population is not estimated too certainly the baptismal figures are open to some question.

The figures for birth rate (baptisms) are among the most difficult data to secure. These given in table 15 come from late medieval Italy and from Barcelona, Spain.

4. PERSISTENCE OF PHYSICAL TYPE

As we have seen, the cities seem to have had a lower sex ratio, lower percentage of married people, lower proportion of children, and a higher death rate than the smaller places. In a society which was barely maintaining its population, the cities were obviously forced to recruit from the country villages. This has interesting implications from the standpoint of the preservation of physical type over the centuries, a condition which is considered natural by the anthropologists. The persistence of type may be explained in part by the fact that in the cities, where persons of various origins mix, the population is really dying out.

Another condition, assortative mating, encourages even more the development and persistence of physical type.[33] Assortative mating is the human habit of marriage between persons of similar physical and mental types. This would, of course, tend to keep the atypical from marrying as frequently as the typical and would indeed tend to put pressure upon the atypical to leave the village for the city. This process would cause the personnel of the village to conform more to the local standard. Unless disturbed by mass migration the type should remain indefinitely.

Human physical type would vary from village to village, producing a series of modifications of type as one moved through areas. However, any marked hindrance to movement, such as a steep mountain range or the ocean might set up a barrier which would create a break in type. Similarly a sharp difference in language might produce a barrier. The borderland where languages meet often shows a bilingual culture influenced by both language speaking groups even though there is a physical disparity between the two. The resultant culture is usually different from either of the two impinging cultures.

Furthermore, social barriers even within villages may be a limiting force upon the mixing of physical type. In England until the Norman Conquest the short dark *servi* seem to have remained distinct from the surrounding Celts and Anglo-Saxon settlers who were taller and lighter in complexion.[34] Even within the villages there would be a tendency to standardize not one but two or three types because of social pressure.

The data are, as can be seen, of a fragmentary character and yet they present a fairly understandable picture. The remarkable feature of the sex ratio is its height: in much of the Middle Ages it stood between 110 and 130 and was more often nearer the latter figure. The figures in regard to hypothetical fertility show that there was, assuming fecundity to be as high as today, ample opportunity for enough children to increase population rapidly unless the death rate was very high. Only the serfs seem to have had such a low marriage percentage that natural increase was unlikely. The

[32] Beloch, *BI* **2**: 148.

[33] Anderson, C. A., Our present knowledge of assortative mating, *Rural Sociology* **3**: 296–302, 1938: Burgess, E. W., and P. Wallin, Homogamy in social characteristics, *Amer. Jour. Sociology* **49**: 109–124, 1943; Uggè, A., Sulla rassomiglianza fra coniugi per alcuni caratteri somatici, Milan, U. Cattolica del Sacro Cuore, Laboratorio di Statistica **7**: 117–207, 1934.

[34] Russell, J. C., The short, dark folk of England, *Social Forces* **24**: 340–347, 1946.

difference between the potential and the actual birth rate raises the question as to the reason. We shall see in the next chapter that the actual death rate only partially accounts for the failure to increase rapidly.

The margin between birth rate and death rate in Roman times was not great at best. Disease plus infanticide probably is the chief cause of the difference in proportion of the sexes. Under these circumstances contraception was not necessary to preserve the static relationship between environment and population. However, the simplest methods of contraception were known. One doctor stands out for his rather advanced knowledge of technique toward this subject. This man was Soranos of Ephesus (early second century). It is reasonable to assume that people would be as anxious to avoid pregnancy as they were to avoid raising children once they were born.[35] That contraceptive practice existed in the thirteenth century is clear from the statements of Arnald of Villa Nova and Albertus Magnus as to how it was done.[36] Thomas Aquinas opposed it but said surprisingly little against it. Even as early as the tenth century, doctors were being cautioned not to give advice to women seeking to secure information about abortion.[37] The ever continuing high sex ratio is evidence of something rather awful happening to a number of girl babies and probably to a certain number of boys as well.

It seems clear then that medieval society had its family and its population well under control. In reality it had sufficient families to increase the population if necessary and more than enough children to maintain its numbers except under the most severe circumstances. The thought of the society then was the dominant factor in the demographic development of the time. Nevertheless, the margin was not great and a sudden catastrophe might easily reduce the advances of a century if it struck severely enough.

III. EXPECTATION OF LIFE

Like the information about other phases of population study, information about length of life or its more technical definition, expectation of life, exists in some quantity for the beginning and end of the period. For the centuries in the middle chronologically there are only a few meager hints, mostly of age at death of well-known persons. From the data, however, considerable information can be derived. This chapter will take up first the definitions and problems which appear in research upon length and expectation of life. It will then follow with a study of the evidence from the later Roman Empire, the much fuller information of late medieval England and the scattered data from other places. Then the problem of span of life, particularly the interesting experiment of the pillar saints, will be presented, followed by some evidence of medieval mortality rates.

1. DEFINITIONS AND PROBLEMS

By length of life is usually meant the average length of life from birth. It is the figure usually given if only one is presented. Expectation of life is the average length of time a person lives after a particular age. It is sometimes called the "mean after lifetime." The span of life normally indicates the top limit of life, the age that few attain. All of these have their problems. Our modern population experts profit greatly by the study of those phases of demography by experts of the life insurance companies such as the well-known team of Dublin and Lotka.[1] While medieval problems differ much from those of modern times, modern conditions do approximate the medieval sufficiently to give a background and some clues to the solution of earlier problems.

Length of life or expectation at birth gives a grim picture of the conditions of life before the era of bacteriology. It includes infant and child mortality which were often very high. If the deaths of two persons who passed away at the ages of ninety and one are averaged, as must be done for the determination of length of life the result is 45.5. What we are apt to visualize then is two people each dying in middle age instead of one very old and one very young person. Actually, if one lived through all of the dangers of the first thirty years of life, he had normally a fine constitution and good immunity against ordinary diseases and might live a long time even by modern standards. Now the use of length of life has another serious disadvantage in the Middle Ages. The data on infant and child mortality are so few and so poor that the results are not very certain. Since the miscalculation of the mortality of the early years influences greatly the calculation of total mortality, the uncertainty of the early years makes the average age rather unsatisfactory as a figure for ordinary use.

The expectation of life, particularly the expectation at ages from twenty to fifty, is a much more satisfactory standard. The great mass of the evidence falls within these years so that, statistically, the chances are better for the purposes of calculation. They are not disturbed by the peculiar difficulties which exist for the very young and the very old. The evidence from the inquisi-

[35] N. E. Himes does not believe that there was much contraception in the period. *Medical History of Contraception*, 79–101, London, 1936.

[36] *Ibid.*, 160–166, quoting Ryan's translation of the *Summa theologica*, sect. 2, qu. 154, art. 1 and the *Summa contra Gentiles*, bk. iii, ch. 122. See also art. xi and xii of qu. 154.

[37] For abortion see MacKinney, L. C., Medical ethics and etiquette in the early Middle Ages, *Bull. Hist. Medicine* **26**: 19, 1952.

[1] Probably their work of most interest to students of population history is *Length of life*, New York, 1936, but both wrote upon many phases of population. This book has recently been revised with M. Spiegelman added as a collaborator.

tions post mortem of England are really valuable from about age ten on since the number who fell heir earlier was small. Similarly, the information from the sepulchres of the Roman Empire also is valuable for the middle period. Furthermore, the mortality by five-year periods does not seem to vary so sharply in those years although the mortality does increase markedly within the age limits. The figures then of expectation do reflect reasonably well the general conditions of health and mortality within the periods for which the data are numerous.

The problem of the span of life is most difficult. One very human tendency is to exaggerate the age of the very elderly, a failing which appears even in the official censuses of countries today. It is naturally worse in those areas in which birth certificates are unknown or have come into use only recently. Fortunately, the English inquisitions post mortem fix death ages at the proper distance because they are calculated from the number of years in which the person first appears. The age of inheritance is usually an age when the temptation to exaggerate one's age is not important. In these inquisitions post mortem no calculation showed a man actually aged one hundred years. The span is the age limit of mankind and presumably is about the century mark; only a few well authenticated cases have been much above this mark. The span of life then is a rather uncertain age and presumably has not varied much since the human race biologically is about the same now that it has been for several millennia, the data from Roman Africa notwithstanding.

The statisticians have developed a device called a life table which is very useful for purposes of studying age groups in a population. The table follows the course of life of an arbitrary number (usually called a cohort and set at 1,000 or 100,000) from birth until death. We are using here an abbreviated life table based on five-year intervals. The first column gives the years of age under consideration. Since the death rate of the first year of life is so high, that year is usually considered alone. The next four years also have an abnormally high rate and constitute a unit. After this the divisions are for five years, 5–9, 10–14, and on to the last deaths. The advantage of using the 5–9 division is that people who are actually in the 6, 7, or 8 age (that is, for example 36, 37, or 38 years) years frequently give their age as of the 5 (in the example, 35), while those in the 1, 2, or 3 give theirs as to the preceding even number. This rounding is a constant factor whenever ages are asked. Furthermore, during the five-year period the rate of mortality is very nearly the same. It is, of course, possible to use ten-year intervals but the result is not as accurate.[2]

The second column of the life table gives the mortality of the group in the age interval in terms of per cent or other designated proportion (q_x). The third column (if used) presents the probability of surviving the age interval (p_x) and is the percentage secured by subtracting the mortality rate from 100. Thus $p_x = 100 - q_x$. The fourth column (l_x) has the initial cohort at the top. The subsequent numbers are secured by multiplying the number for the preceding interval by the probability of surviving (p_x) in the preceding interval. The fifth column (L_x) is the number of years lived in the age interval by the cohort. If everyone lived through the intervals of five years it could be secured by multiplying the number surviving (l_x) by five. Since some die the number is secured by multiplying the initial number (l_x) plus the number in the next interval by 2½. This is based upon the assumption mentioned above that the death rate does not vary much in the interval. For the first year of life and for the interval 1–4 formulas have been worked out since the death rate is much greater at the beginning than at the end of the period.[3]

The next to the last column (T_x) gives the years of life remaining at each age for the whole cohort. It is produced by adding from the bottom of the preceding column. The last column gives the expectation of life (e_x^o) at each age. It is secured by dividing the years of life remaining at each age by the number surviving to that age, that is T_x by l_x.

The last three columns give the proportions of the population in the various age intervals if the population has not been affected by either migration or changing birth rate. It will give an approximate proportion if it has not been changed much by either of these developments. This is very useful for purposes of population study. For instance, if it is known at about what age on the average men marry, an estimate can be made of the size of the family by dividing the number of men above this age into the total population. Similarly when an age limit is set to taxation the life table enables one to estimate the percentage of population included. The poll tax of 1377 in England included all those fourteen and above is an illustration of the kind of problem here presented.

The life table as a statistical device is limited to statistical interpretation of the evidence to which it is applied. The historical value of the evidence is no better than the historical value of the data. Thus, when data from the inquisitions post mortem were used, they had first to be examined for their historical worth. The question had to be answered: when an inquisition reports that an heir is fifteen, thirty, or sixty how near to fifteen, thirty, or sixty is he actually? This must be emphasized because historians and statisticians have queried whether medieval data are sufficiently accurate

[2] On types of life tables see Dublin, L. I., and M. Spiegelman, Current versus generation life tables, *Human Biology* **13**: 439–458, 1941.

[3] The formulas of L. J. Reed and Margaret Merrill, in a short method of constructing an abridged life table, *Amer. Jour. Hygiene* **30**: 33–62, 1939. The formulas are: for the first year of life ($L_0 = .2\ l_0 + .8\ l_1$) and for the next four years ($L_{1-4} = 0.34\ l_0 + 1.184\ l_1 + 2.782\ l_5$).

to justify treating them statistically. The rounding of ages in modern censuses does not prevent modern statisticians from using the census data, nor does even the failure to age rapidly enough after twenty-one or the tendency to age too rapidly after eighty. Absolute accuracy is probably possible only in the field of theory.

2. ROMAN EVIDENCE

The people of the Roman Empire were singularly concerned about the memory of the deceased and left a great mass of commemorative tablets in honor of the dead. Many of these contained statements about the ages of the deceased and sometimes the length of the married lives of husbands and wives. Most of these inscriptions were collected in a great series called the *Corpus Inscriptionum Latinarum*.[4] The great lawyer, Ulpian, even in Roman times had set up values of annuities based upon age. A series of studies of expectation based upon Roman inscriptions has been produced in the last century. Then there is some information which can be based upon the survival of Ausonius' relatives. From these some picture of the expectation of the empire can be presented.

A table of values has been attributed to Ulpian in the *Digest*.[5] He was a famous jurist and administrator in the second and third centuries. The values are either (*a*) of years of expectation or (*b*) expectation reduced by interest from date of issue to date of expected death.[6] They were set up to enable a court to capitalize annuity payments to settle estates, especially when the assets of the deceased had so declined that it was necessary to reduce legacies to enable the heirs to inherit the legal minimum of 25 per cent of the estate.[7] In any case the years are minima.

0–20	30	41–42	18	47–48	12
20–25	27	42–43	17	48–49	11
25–30	25	43–44	16	49–50	10
30–35	22	44–45	15	50–55	9
35–40	20	45–46	14	55–60	7
40–41	19	46–47	13	60+	5

The use made of the Roman inscriptions has been rather haphazard. Beloch made a very simple study of some of the Italian evidence,[8] in his great study of 1886. Shortly thereafter the African evidence was tabulated and then used as part of a quite comprehensive study published by Harkness in a standard American journal.[9] This study escaped both an Italian and an Englishman who published parts of the evidence in 1903 and 1913 respectively.[10] However, although the duplication was marked, the evidence was not presented in the same way by them. Harkness did not separate the data by sex of subject and only gave the expectation at birth. The Italian study presented incidence of mortality by years of life and the English, graphs showing expectation by age and sex. The data as considered by volume of the C.I.L. were as follows:

Harkness, vols. II, III, V, VI, VII, VIII, IX, X, XI, XII, XIV
De Marchi, vols. V, VI
Macdonell, vols. II, VI, VIII

A recent and interesting study by A. R. Burn is perhaps too critical of the data.[11]

The assumption upon which all of the studies are based is that inscriptions present a random sample of the deaths in the empire and thus can be the basis for a reasonably accurate estimate of the expectation there. It assumes that the sample was disturbed by heavy migration neither into the empire nor into certain provinces, and that the population was not changing rapidly in the period. This seems true even for the early period of one–four years of age. At least the Roman percentage is not far from the few data of infant mortality at the end of the chapter. Infant mortality (that is, of children in the first year of life) is much too low in the Roman tables. This failure to mark the existence of the very young is fairly common even in the U. S. Census. We correct in brackets by substituting double the mortality of the one–four age group, believing that the result will be fairly accurate since conditions which affect mortality of the very young should also affect those of the period one–four years of age. Minima of 12 and 6 per cent are set for the two age groups on the assumption that less than these represents failure to record. It is true, of course, that the newly born have immunity for a time against certain diseases, but the very high infant mortality shows that this immunity is not general.

Beloch produced the first information approximating that of a life-table, using the data from the *CIL* for districts I, II, and III of Italy. He divided the data

[4] Produced by the Berlin Academy in the nineteenth century and arranged by areas as follows: I Early Latin, II Iberia, III Asia, Greece and Illyricum, IV Rome, V Cisalpine Gaul, VI Rome, VII Britain, VIII Africa, IX Calabria, Apulia, Samnium, Sabinum and Picenum, X Brutii, Lucania, Campania, Sicily and Sardinia, XI Aemilia, Umbria and Etruria, XII Narbonese Gaul, XIII–XIV Latium.

[5] XXX, ii, 68.

[6] Explained in Trenerry, C. F., *The origin and early history of insurance*, 150–152, London, 1926.

[7] The statement "ad legem vicesimam hereditatum" would suggest that the capitalization was for the purpose of computing the inheritance tax. Note also "computationi in alimentis faciendae hanc formam esse Ulpianus scribit, ut a prima, etc."

[8] Beloch, *BGRW*, 51.

[9] Seidel, H., *Über römischen Grabinschriften*, 1891. Harkness, A. G., Age at marriage and at death in the Roman Empire, *Trans. Amer. Philol. Assoc.* **27**: 35–72, 1896.

[10] De Marchi, A., Cifre di mortalità nelle iscrizioni romane, *Rendiconti* R. Istituto Lombardo di Scienze e Lettere, ser. 2, **336**: 1025–1034, 1903; Macdonell, W. R., On the expectation of life in ancient Rome, *Biometrika* **9**: 36–80, 1913; on the subject see Pearson, K., On the change in the expectation of life during the period 2,000 B.C. to the present, *Biometrika* **1**: 261–264, 1901–1902.

[11] Burn, A. R., Hic breve vivitur, *Past and present* **4**: 2–31, 1953. This came to my attention after this chapter had been written.

TABLE 16

ROMAN EXPECTATION OF LIFE, BELOCH

At age	Men	Women
10	27–28	25–26
20	36–37	30–31
30	45–46	41–42
40	55–56	55–56
50	60–61	60–61
60	70–71	68

Source: Beloch, *BGRW*, 51.

according to sex of the dead and produced the following expectation comparing it with that given by Ulpian. He gives expectation in terms of years of life which may be expected to be reached.

The life tables show the effects of rounding of numbers, that is, more appear for the 10–14's than for the 5–9's. When the entire list of numbers is given the results are more apparent: about half appear for the 10 and the other for the 11–14. However, by grouping all of the five together a more accurate result is attained since most of those rounded to 10 are higher. In general those rounded to 5 are more accurate since such rounding is usually from the next four higher. On the other hand some rounded to 10 come from all of the ten higher although most from the next four. The effect of this can be seen in the tables if one compares the average of neighboring 5–9's with the average for the 10–14 between. However, the result is notably less for the 60–64, 70–74 and 80–84 intervals and even here the average is probably only a year or so higher than the number as given in the life table. The result is probably accurate within the limits of the time of information given in the data, that is, reasonably accurate to the extent that the number of inscriptions conforms to the pattern of mortality of the period.

The information about age at death in Egypt in the millennium from the third century B.C. to the seventh century A.D. has recently been collected (table 30).[12] It presents information about 813 persons. The authors note a heavy preponderance of men and believe that these persons derive almost entirely from the wealthier classes. The distribution by age is characteristic of ancient data presenting this type of information. The rounding to ages fifty and sixty is very marked. If the medieval British pattern holds here, the tendency would be to round to the number below and thus to understate age.[13] In this case it would seem that age fifty has attracted heavily from both lower and higher ages while age sixty is rounded heavily from the higher ages alone. The altered corrected ages do not change the average length of life much and do approximate the

[12] Hombert, M. et C. Préaux, Note sur la durée de la vie dans l'Égypte Gréco-Romaine, *Chronique d'Égypte* **20**: 139–146, 1945. See also their *Recherches sur le recensement dans l'Égypte romaine* 159, Leiden, E. J. Brill, 1952.

[13] Hombert et Préaux, Note, 143; Russell, *BMP*, 201.

TABLE 17

LIFE TABLE BASED UPON TOMB INSCRIPTIONS: IBERIA, FEMALE

Age interval	Died in age interval	Totals in age interval	Mortality rate for interval	Number of years lived in age interval	Years of life remaining	Expectation of life at age x
x to $x+n$		l_x	q_x	L_x	T_x	e_x^0
0	2	885(1,042)	12	942	31,506	30.2
1–4	21	883(917)	6	3,683	30,564	33.3
5–9	40	862	4.6	4,210	26,881	31.2
10–14	42	822	5.1	4,005	22,671	27.6
15–19	93	780	11.9	3,668	18,666	23.9
20–24	110	687	16.0	3,160	14,998	21.8
25–29	128	577	22.2	2,565	11,838	20.5
30–34	84	449	18.7	2,035	9,323	20.8
35–39	58	365		1,680	7,288	20.0
40–44	63	307		1,378	5,608	18.3
45–49	29	244		1,148	4,230	17.3
50–54	62	215		920	3,082	14.3
55–59	33	153		682	2,162	14.1
60–64	38	120		505	1,480	12.3
65–69	16	82		370	975	11.9
70–74	28	66		260	605	9.2
75–79	15	38		152	345	9.1
80–84	10	23		90	193	8.4
85–89	6	13		50	103	8.0
90–94	2	7		30	53	7.6
95–99	3	5		18	23	4.6
100+	2	2		5	5	2.5

Sources: *CIL*, II with suppl. and data from *Eph. Epig.* VIII, IX by Macdonell, 378–379. The per cent mortality for the two lowest age groups are the minima, twelve and six per cent.

TABLE 18

LIFE TABLE BASED UPON TOMB INSCRIPTIONS: IBERIA, MALE

Age interval	Died in age interval	Totals in age interval	Mortality rate for interval	Number of years lived in age interval	Years of life remaining	Expectation of life at age x
x to $x+n$		l_x	q_x	L_x	T_x	e_x^0
0	4	1,111 (1,296)	12	1,172	45,800	35.3
1–4	31	1,107 (1,141)	6	4,784	44,628	39.1
5–9	31	1,076		5,302	39,844	37.0
10–14	47	1,045		5,108	34,542	33.1
15–19	99	998	9.9	4,742	29,434	29.5
20–24	131	899	14.6	4,168	24,692	27.5
25–29	108	768	14.1	3,570	20,524	26.7
30–34	96	660	14.5	3,060	16,954	25.7
35–39	62	564		2,665	13,894	24.6
40–44	75	502		2,322	11,229	22.4
45–49	49	427		2,012	8,907	20.9
50–54	63	378		1,732	6,895	18.2
55–59	46	315		1,460	5,163	16.4
60–64	74	269		1,160	3,703	13.7
65–69	32	195		895	2,543	13.0
70–74	63	163		658	1,648	10.1
75–79	30	100		425	990	9.9
80–84	31	70		272	565	8.1
85–89	16	39		155	293	7.5
90–94	11	23		88	138	6.0
95–99	8	12		40	50	4.2
100+	4	10		10	10	2.5

Sources: same as preceding.

TABLE 19

LIFE TABLE BASED UPON TOMB INSCRIPTIONS: ASIA, GREECE, ILLYRICUM

Age interval	Died in age interval	Totals in age interval	Mortality rate for interval	Number of years lived in age interval	Years of life remaining	Expectation of life at age x
x to $x+n$		l_x	q_x	L_x	T_x	e_x^0
0	12	2,345 (2,728)	[14.48]	2,412	79,592	29.2
1–4	169	2,333	7.24	9,710	77,180	33.1
5–9	173	2,164	7.99	10,388	67,476	31.2
10–14	120	1,991	6.02	9,655	57,082	28.7
15–19	176	1,871	9.41	8,915	47,427	25.3
20–24	242	1,695	14.28	7,870	38,512	22.7
25–29	231	1,453	15.90	6,688	30,642	21.1
30–34	297	1,222	24.30	5,368	23,954	19.6
35–39	163	925	17.62	4,218	18,586	20.1
40–44	173	762	22.70	3,378	14,368	18.9
45–49	89	589	15.11	2,722	10,990	18.7
50–54	115	500	23.0	2,212	8,268	16.5
55–59	32	385	8.31	1,845	6,056	15.7
60–64	129	353	36.54	1,442	4,211	11.9
65–69	33	224	14.73	1,038	2,767	12.4
70–74	81	191	42.41	752	1,731	9.1
75–79	27	110	24.54	482	979	8.9
80–84	54	83	65.06	280	497	6.0
85–89	10	29	34.48	120	217	7.5
90–94	9	19	47.37	72	97	5.1
95–99[a]	10[a]	10	100	25	25	2.5

[a] Those listed as over 100 (5) omitted.
Source: *CIL*, III; Harkness, 59–62

TABLE 20

LIFE TABLE BASED UPON TOMB INSCRIPTIONS: CISALPINE GAUL

Age interval	Died in age interval	Totals in age interval	Mortality rate	Number of years lived in age interval	Years of life remaining	Expectation of life at age x
x to $x+n$		l_x	q_x	L_x	T_x	e_x^0
0	2	927 (1,210)	[23.56]	982	25,078	20.7
1–4	109	925	11.78	3,777	24,095	26.0
5–9	98	816	12.	3,840	20,319	24.9
10–14	67	718	9.33	3,422	16,479	23.0
15–19	117	651	17.97	2,962	13,057	20.1
20–24	144	534	26.97	2,310	10,095	18.9
25–29	94	390	24.10	1,715	7,785	20.0
30–34	69	296	23.31	1,308	6,070	20.5
35–39	45	227	19.82	1,022	4,762	21.0
40–44	38	182	20.87	815	3,740	20.5
45–49	24	144	16.66	660	2,925	20.3
50–54	22	120	18.33	545	2,265	18.9
55–59	13	98	13.26	458	1,720	17.6
60–64	22	85	25.88	370	1,262	14.8
65–69	10	63	15.87	290	892	14.2
70–74	16	53	30.18	225	602	11.4
75–79	8	37	21.62	165	377	10.2
80–84	14	29	48.28	110	212	7.3
85–89	5	15	33.33	62	102	6.8
90–94	7	10	70.	32	40	4.
95–99[a]	3	3	100	8	8	2.5

[a] Those over 100 not counted (2).
Source: *CIL*, V; Harkness, 59–61.

TABLE 21

LIFE TABLE BASED UPON TOMB INSCRIPTIONS: ROME, MALE

Age interval	Died in age interval	Totals in age interval	Mortality rate for age interval	Number of years lived in age interval	Years of life remaining	Expectation of life at age x
x to $x+n$		l_x	q_x	L_x	T_x	e_x^0
0	74	4,575 (6,924)	(35.0)	4,986	106,037	15.3
1–4	788	4,501	17.5	18,013	101,051	22.5
5–9	759	3,713		16,668	83,038	22.4
10–14	419	2,954		13,722	66,370	22.5
15–19	528	2,535		11,355	52,648	20.8
20–24	435	2,007		8,948	41,293	20.6
25–29	313	1,572		7,078	32,345	20.6
30–34	261	1,259		5,642	25,267	20.0
35–39	216	998		4,450	19,625	19.7
40–44	193	782		3,428	15,175	19.4
45–49	99	589		2,698	11,747	19.9
50–54	92	490		2,220	9,049	18.5
55–59	54	398		1,855	6,829	17.2
60–64	103	344		1,462	4,974	14.4
65–69	41	241		1,102	3,512	14.6
70–74	58	200		855	2,410	12.0
75–79	31	142		633	1,555	11.0
80–84	48	111		435	922	8.3
85–89	21	63		262	487	7.7
90–94	22	42		155	225	5.4
95–99	16	20		60	70	3.5
100+	4	4		10	10	2.5

Source: *CIL*, IV by Macdonell, 378–379.

TABLE 22

LIFE TABLE BASED UPON TOMB INSCRIPTIONS: ROME, FEMALE

Age interval	Died in age interval	Totals in age interval	Mortality rate for age interval	Number of years lived in age interval	Years of life remaining	Expectation of life at age x
x to $x+n$		l_x	q_x	L_x	T_x	e_x^0
0	46	(4,731) 3,490	(27.2)	3,701	77,077	16.3
1–4	470	3,444	13.6	13,960	73,376	21.3
5–9	456	2,974		13,730	59,416	20.0
10–14	330	2,518		11,765	45,686	18.1
15–19	519	2,188		9,642	33,921	15.5
20–24	482	1,669		7,140	24,279	14.5
25–29	387	1,187		4,968	17,139	14.4
30–34	247	800		3,382	12,171	15.2
35–39	169	553		2,342	8,789	15.9
40–44	97	384		1,678	6,447	16.8
45–49	75	287		1,272	4,769	16.6
50–54	50	212		935	3,497	16.5
55–59	24	162		750	2,562	15.8
60–64	41	138		588	1,812	13.1
65–69	22	97		430	1,224	12.6
70–74	22	75		320	794	10.6
75–79	19	53		218	474	8.9
80–84	17	34		128	256	7.5
85–89	7	17		68	128	7.5
90–94	4	10		40	60	6.0
95–99	5	6		18	20	3.3
100+	1	1		2	2	2.5

Source: same as preceding table.

TABLE 23

LIFE TABLE BASED UPON TOMB INSCRIPTIONS: AFRICA, FEMALE

Age interval	Died in age interval	Totals in age interval	Mortality rate for age interval	Number of years lived in age interval	Years of life remaining	Expectation of life at age x
x to $x+n$		l_x	q_x	L_x	T_x	e_x^0
0	16	4,459 (5,166)	(12)	4,670	210,514	40.7
1–4	170	4,443 (4,546)	(6)	19,026	205,844	45.3
5–9	158	4,273		20,970	186,818	43.7
10–14	172	4,115		20,145	165,848	40.3
15–19	252	3,943		19,085	145,703	37.0
20–24	319	3,691		17,658	126,618	34.3
25–29	351	3,372		15,982	108,960	32.3
30–34	342	3,021		14,250	92,978	30.6
35–39	303	2,679		12,638	78,728	29.4
40–44	301	2,376		11,128	66,090	27.8
45–49	176	2,075		9,935	54,962	26.5
50–54	222	1,899		8,940	45,027	23.7
55–59	152	1,677		8,005	36,087	21.5
60–64	268	1,525		6,955	28,082	18.4
65–69	178	1,257		5,840	21,127	16.8
70–74	254	1,079		4,760	15,287	14.2
75–79	209	825		3,602	10,527	12.8
80–84	211	616		2,552	6,925	11.2
85–89	126	405		1,710	4,373	10.8
90–94	80	279		1,195	2,663	9.5
95–99	59	199		848	1,468	7.4
100–4	86	140		485	620	3.5
105+	54	54		135	135	2.5

Source: *CIL*, VIII and 3 suppl. by Macdonell, 378–379.

TABLE 24

LIFE TABLE BASED UPON TOMB INSCRIPTIONS: AFRICA, MALE

Age interval	Died in age interval	Totals in age interval	Mortality rate for age interval	Number of years lived in age interval	Years of life remaining	Expectation of life at age x
x to $x+n$		l_x	q_x	L_x	T_x	e_x^0
0	32	6,238 (7,227)	(12)	6,533	309,795	42.9
1–4	228	6,206 (6,360)	(6)	26,618	303,262	47.7
5–9	219	5,978		29,342	276,644	46.3
10–14	247	5,759		28,178	247,302	42.9
15–19	324	5,512		26,750	219,124	39.8
20–24	407	5,188		24,922	192,374	37.1
25–29	399	4,781		22,908	167,452	35.0
30–34	403	4,382		20,902	144,544	33.0
35–39	344	3,979		19,035	123,642	31.0
40–44	361	3,635		17,272	104,607	28.8
45–49	274	3,274		15,685	87,335	26.7
50–54	355	3,000		14,112	71,650	23.9
55–59	256	2,645		12,585	57,538	21.8
60–64	368	2,389		11,025	44,953	18.8
65–69	265	2,021		9,442	33,928	16.8
70–74	421	1,756		7,728	24,486	13.9
75–79	305	1,335		5,912	16,758	12.6
80–84	370	1,030		4,225	10,846	10.5
85–89	219	660		2,752	6,621	10.0
90–94	163	441		1,798	3,869	8.8
95–99	101	278		1,138	2,071	7.4
100–4	79	177		688	933	5.3
105+	98	98		245	245	2.5

Source: same as preceding.

TABLE 25

LIFE TABLE BASED UPON TOMB INSCRIPTIONS: CALABRIA, APULIA, SAMNIUM, SABINUM, PICENUM

Age interval	Died in interval	Totals in age interval	Mortality rate for interval	Number of years lived in age interval	Years of life remaining	Expectation of life at age x
x to $x+n$		l_x	q_x	L_x	T_x	e_x^0
0	6	892 (1,060)	[16.4]	921	26,104	24.6
1–4	73	886	8.2	3,671	25,183	28.4
5–9	97	813	11.9	3,822	21,512	26.5
10–14	85	716	11.9	3,368	17,690	24.7
15–19	125	631	19.8	2,842	14,322	22.7
20–24	107	506	21.1	2,262	11,480	22.7
25–29	68	399	17.0	1,825	9,218	23.1
30–34	59	331	17.8	1,508	7,393	22.3
35–39	50	272	18.4	1,235	5,885	21.6
40–44	39	222	17.6	1,012	4,650	20.9
45–49	20	183	10.9	865	3,638	19.9
50–54	30	163	18.4	740	2,773	17.0
55–59	23	133	17.3	608	2,033	15.3
60–64	35	110	31.8	462	1,425	13.0
65–69	12	75	16.0	345	963	12.8
70–74	23	63	36.5	258	618	9.8
75–79	10	40	25.0	175	360	9.0
80–84	19	30	63.3	102	185	6.2
85–89	4	11	36.4	45	83	7.5
90–94	3	7	42.8	28	38	5.4
95–99	4	4	100.0	10	10	2.5

Source: *CIL*, IX; Harkness, 55–57.

TABLE 26

LIFE TABLE BASED UPON TOMB INSCRIPTIONS: BRUTII, LUCANIA, CAMPANIA, SICILY, AND SARDINIA

Age interval	Died in age interval	Totals in age interval	Mortality rate for interval	Number of years lived in age interval	Years of life remaining	Expectation of life at age x
x to $x+n$		l_x	q_x	L_x	T_x	e_x^0
0	10	1,913 (2,349)	(19)	1,992	57,701	24.6
1–4	181	1,903	9.5	7,842	55,709	29.3
5–9	169	1,722	9.8	8,188	47,867	27.8
10–14	141	1,553	9.1	7,412	39,679	25.5
15–19	215	1,412	15.2	6,522	32,267	22.9
20–24	205	1,197	17.1	5,472	25,745	21.5
25–29	190	992	19.2	4,485	20,273	20.4
30–34	139	802	17.3	3,662	15,788	19.7
35–39	125	663	18.9	3,002	12,126	18.3
40–44	134	538	24.9	2,355	9,124	17.0
45–49	72	404	17.8	1,840	6,769	16.8
50–54	88	332	26.5	1,440	4,929	14.8
55–59	45	244	18.4	1,108	3,489	14.3
60 64	69	199	34.7	822	2,381	12.0
65–69	25	130	19.2	588	1,559	12.0
70–74	42	105	40.0	420	971	9.2
75 79	21	63	33.3	262	551	8.7
80–84	24	42	57.1	150	289	6.9
85–89	5	18	27.8	77	139	7.7
90–94	7	13	53.8	47	62	4.8
95–99	6	6	100.0	15	15	2.5

Source: *CIL*, X; Harkness, 57–59. 95–99 includes four above 100.

TABLE 27

LIFE TABLE BASED UPON TOMB INSCRIPTIONS: AEMILIA, UMBRIA AND ETRURIA

Age interval	Died in interval	Totals in age interval	Mortality rate for interval	Number of years lived in age interval	Years of life remaining	Expectation of life at age x
x to $x+n$		l_x	q_x	L_x	T_x	e_x^0
0	7	(732) 631	(14.8)	645	20,768	28.4
1–4	46	624	7.4	2,596	20,123	32.2
5–9	46	578	7.4	2,774	17,527	29.9
10–14	42	532	7.9	2,555	14,753	27.7
15–19	54	490	11.0	2,315	12,198	24.9
20–24	80	436	18.3	1,980	9,883	22.7
25–29	55	356	15.4	1,642	7,903	22.2
30–34	52	301	17.2	1,375	6,261	20.8
35–39	40	249	16.0	1,145	4,886	19.6
40–44	46	209	22.8	930	3,741	17.8
45–49	30	163	18.4	740	2,811	17.2
50–54	26	133	19.6	600	2,071	15.6
55–59	25	107	23.4	472	1,471	13.7
60–64	20	82	24.4	360	999	12.2
65–69	17	62	27.4	268	639	10.3
70–74	22	45	48.9	170	371	8.2
75–79	9	23	39.1	92	201	8.7
80–84	6	14	42.9	55	109	7.8
85–89	2	8	25.0	35	54	6.8
90–94	5	6	84.7	17	19	3.2
95–100	1	1	100.0	2	2	2.0

Source: *CIL*, XI; Harkness, 57–59.

TABLE 28

LIFE TABLE BASED UPON TOMB INSCRIPTIONS: GAUL (NARBONNE)

Age interval	Died in age interval	Totals in age interval	Mortality rate for interval	Number of years lived in age interval	Years of life remaining	Expectation of life at age x
x to $x+n$		l_x	q_x	L_x	T_x	e_x^0
0	1	422 (520)	(19.0)	441	11,979	23.0
1–4	40	421	9.5	1,735	11,538	27.4
5–9	40	381		1,805	9,803	25.7
10–14	38	341		1,610	7,998	23.5
15–19	51	303		1,388	6,388	21.1
20–24	63	252		1,102	5,000	19.8
25–29	40	189		845	3,998	21.2
30–34	33	149		662	3,053	20.5
35–39	23	116		522	2,391	20.6
40–44	17	93		422	1,869	20.1
45–49	17	76		338	1,447	19.0
50–54	10	59		270	1,109	18.8
55–59	8	49		225	839	17.1
60–64	11	41		178	614	15.0
65–69	6	30		135	436	14.5
70–74	7	24		102	301	12.5
75–79	3	17		78	199	11.7
80–84	5	14		58	121	8.6
85–89	4	9		35	63	7.0
90–94	2	5		20	28	5.6
95–99	1	3		8	8	2.7
100+	2					

Source: *CIL*, XII; Harkness, 57–59.

TABLE 29

LIFE TABLE BASED UPON TOMB INSCRIPTIONS: LATIUM

Age interval	Died in interval	Totals in age interval	Mortality rate for interval	Number of years lived in age interval	Years of life remaining	Expectation of life at age x
x to $x+n$		l_x	q_x	L_x	T_x	e_x^0
0	17	747 (1,127)	(35.2)	809	16,302	14.5
1–4	131	730	17.6	2,914	15,493	21.2
5–9	116	599	19.4	2,705	12,579	21.0
10–14	85	483	17.6	2,202	9,874	20.4
15–19	88	398	22.1	1,770	7,672	19.3
20–24	74	310	23.9	1,365	5,902	19.0
25–29	66	236	28.0	1,015	4,537	19.2
30–34	38	170	22.4	755	3,522	20.7
35–39	25	132	18.9	598	2,767	20.1
40–44	27	107	25.2	468	2,169	20.3
45–49	15	80	18.8	362	1,701	21.3
50–54	15	65	23.1	288	1,339	20.6
55–59	6	50	12.0	235	1,051	21.0
60–64	9	44	20.5	198	816	18.5
65–69	1	35	2.9	172	618	17.7
70–74	9	34	26.5	148	446	13.1
75–79	6	25	24.0	110	298	11.9
80–84	6	19	31.6	80	188	9.9
85–89	2	13	15.4	60	108	8.3
90–94	7	11	63.6	38	48	4.4
95–100	4	4	100.0	10	10	2.5

Source: *CIL*, XIV; Harkness, 55–57.

usual trend of death rates. Of the ten persons alleged to have died at ninety and above, seven were between ages ninety and ninety-four and three between ninety-five and ninety-nine. The percentage of persons sixty and above is very much like that of a sample from the Egyptian city of Karanis.[14]

The problem of using the data from inscriptions to form a life table is obvious. There are, to start with, too few deaths in the first year of life and too many in the higher age brackets. Efforts have been made to try to correct for the difficulties presented by the evidence. One of these has tried to compare the Roman data with data from the same areas of recent date.[15] Egypt is compared with modern Egypt, Ancient Hispania and Lusitania with Spain and Portugal of 1929, Ancient Africa with Algeria of 1929, and Ancient Rome with Italy of the same date. On the basis of these comparisons the ancient data for the years below fifteen and those over eighty-nine are discarded; for these periods comparable data from modern Chinese farmers are to be substituted. The underlying assumption is that there are two types of expectation, the oriental and

[14] Forty-five of 575 men did not pay certain taxes because they were over sixty (or sixty-two). This information was given me by Professor A. E. R. Boak about Karanis. For background see his The population of Roman and Byzantine Karanis, *Historia* **4**: 157–162, 1955.

[15] Willcox, W. F., The length of life in the early Roman Empire, Congrès International de la Population, Paris, 1927, **2**: 14–22, Démographie Historique, Paris, 1928.

TABLE 30

LIFE TABLE, ROMAN EGYPT

Age interval	Died in interval	Corrected number	Totals in age interval	Mortality rate for interval	Number of years lived in age interval	Years of life remaining	Expectation of life at age x
x to $x+n$			l_x	q_x	L_x	T_x	e_x^0
0			(956)	(15.0)	841	27,396	28.7
1–4	61		813	7.5	3,380	26,555	32.7
5–9	53		752	7.0	3,628	23,175	30.8
10–14	58		699	8.3	3,350	19,547	28.0
15–19	70		641	10.9	3,030	16,197	25.3
20–24	104		571	18.6	2,595	13,167	23.1
25–29	86		467	18.5	2,120	10,572	22.6
30–34	50		381	13.1	1,780	8,452	22.2
35–39	57		331	17.6	1,512	6,672	20.2
40–44	48		274	17.5	1,250	5,160	18.8
45–49	34	45	226	20.0	1,018	3,910	17.3
50–54	60	40	181	22.1	805	2,892	16.0
55–59	25	34	141	24.1	620	2,087	14.7
60–64	35	28	107	26.1	465	1,467	13.7
65–69	21		79	26.6	342	1,002	12.7
70–74	10	17	58	29.3	248	660	11.4
75–79	11		41	26.9	178	412	10.0
80–84	11		30	36.6	122	234	7.8
85–89	9		19	47.4	72	112	5.9
90–94	10	7	10	70	32	40	4.0
95–99		3	3	100	8	8	2.5

Actually 61 deaths, 0–4 years.

occidental with perhaps a transitional type lying between. Since the data from Rome fall, for the years fifteen to eighty-nine, quite reasonably along the oriental lines, it is accepted that the earlier and later periods will be approximately the same.

The study also finds that the proportion of both men and women and the ages of death of the two sexes differ sharply from modern figures and therefore cannot be trusted. However, the sex ratio of 137 of the Romans is not so greatly different from what is found in some other early populations in the Middle Ages and may, indeed, be found more frequently than the relatively equal numbers which are found today. It is possible that the earlier death rate of women may not be so unusual in the Middle Ages either. This was certainly true of England's royal families in the period: the males lived on an average of 31.7 and the females only 29.8.[16] These were, of course, under the best of medical conditions of the islands and in a group where life hazards from warfare and assassination were greater for the men than for the women. If this group of 85 is a representative sample, the medieval men might be expected to have lived longer than the women.

The underlying assumptions of Willcox's study are that the conditions of some of the countries with lesser expectation as late as 1929 correspond closely with those of the Roman Empire. However, there is the factor of total population and even urban population to consider. The tendency, illustrated even by English population in the thirteenth and early fourteenth centuries, is for expectation to decline as the maximum for the potentialities of subsistence is reached. The population of Italy was several times greater in 1929 than in the Roman period while the Spanish and Portuguese population must have been at least twice as large. On the other hand, the population of North Africa probably was not so greatly different in the two periods.

The data from North Africa give an interesting and unusual pattern of mortality. The expectation there, if we believe the table, was much greater than anywhere else and a remarkable number of people lived beyond the century mark. Here probably the tendency of the aged to exaggerate their age had freer play or was more of a custom than elsewhere. The North Africans did have a reputation for attaining great age, even among the Romans. As late as the 16th century great age and hardiness were reported in the mountains although the cities of the coast were said to be unhealthy.[17] Many of the mountaineers were alleged to be over one hundred while the octogenarians were often of remarkable stamina. Jusuf, the Almoravide emir, was said to have lived a century (1006–1106)[18] while somewhat later Abu Yaza el-Nour ben Mymoun ben Abd Allah el Azmyry of the tribe of the Beni Sabyh d'Askoura lived on until 130 greatly admired by his contemporaries for

[16] Russell, *BMP*, 179–180 for the data from which these calculations came.

[17] Leo Africanus, bk. 1. See Paris translation of 1830, 1: 97.

[18] Roudh el-Kartas, *Histoire des souverains du Maghreb*, trans. Baumier, 192, Paris, 1860.

TABLE 31

AGE AT DEATH OF RELATIVES OF AUSONIUS

Age interval	Male	Female	Remarks
0	0	0	
1–4	1	1	Ausonius, son just beginning to talk. X. Aemilia Melania, sister, a year older but died so early that author scarcely remembered her. XXIX.
5–9	1	0	Pastor, grandson, "lad of unripe years." XI.
10–14	1	1	Avitianus, brother, not "beyond the bounds which mark the end of boyhood." XIII. Julia Idalia, cousin, little but had "won Venus' beauty." XXVIII.
15–19	1	3	Paulinus, grandnephew, "in bright years of early youth." XXIII. Julia Veneria, aunt, "an early death." XXVII. Aemilia Dryadia, aunt, "changed your bridal couch for a bier." XXV. Dryadia, grandniece, "torn from her bridal bed." XXIII.
20–29	3	3	Pomponius Maximus Herculanus, nephew, "in the season of his youth —already ripened powers." XVII, P.B.XI. Valerius Latinus Euromius, son-in-law, "in the very bloom of early youth, a father." XIV. Lucanus Talisius, son of sister-in-law, "already wed, early made a father." XX. Namia Pudentilla, sister-in-law, "alas too young, yet had a son." XIX. Attusia Lucana Sabina, wife, died at age 27 or 28. IX. Aemilia Aeonia, mother, died when author a baby. V.
30–39	1	1	Unnamed uncle, aged 30. IV. Veria Luceria, niece, of next generation, yet had children. XVI.
40–49	1	0	Clemens Contemtus, uncle, "still in prime and vigor of his years." VII.
50–59	3	0	Attusius Lucanus Talisius, father-in-law, died at time of daughter's engagement. VIII. Pomponius Maximus, brother-in-law, had children and grandchildren, yet in harvest season of life. XV. Aemilius Magnus Arborius, uncle, famous professor, died while parents still alive. III, P.B.XVI.
60–69	0	3	Julia Dryadia, sister, over 60. XII. Aemilia Hilaria, aunt, aged 63. VI. Pomponia Urbica, joint mother-in-law, dead some years yet probably same age as author. XXX.
70–79	1	2	Paulinus, sister's son-in-law, aged 72. XXIV. Julia Cataphronia, aunt, "lived to old age." XXVI. Aemilia Corinthia Maura, grandmother, lived in author's time, outlived famous son. V, P.B.XVI.
80–89	4	0	Flavius Sanctus, brother-in-law, aged 80. XVIII. Julius Callippio, uncle, "extreme old age." VII. Ausonius, author. *Cf.* pp. viii–xxv. Julius Ausonius, father, over 88. I.
90–99	1	0	Caecilius Argicius Arborius, grandfather, aged 90. IV.
Uncertain	2	1	Attusia Lucana Talisia, sister of wife. XXI. Minucius Regulus, brother-in-law. XXI. Severus Censor Julianus, joint father-in-law. XXII.
Total	20	15	

Sources: references to chapter in *Parentalia*; P.B. reference to *Professors of Bordeaux*.

austere diet and great age.[19] These reports constitute a problem in credibility.

A fourth-century writer, Decimus Magnus Ausonius (*ca.* 310–393), wrote a poem of some thirty chapters upon the memories of thirty-five of his relatives called the *Parentalia*.[20] He wrote when he was about seventy years of age.[21] In the poem he gave indications of the age at death of many of the persons. The sample is, of course, small but of some value for what it is worth. Ausonius was a member of a very prominent family of Aquitaine and eventually held some of the highest offices of the empire. He had been a professor for much of his life.

In table 31 are listed the data available from the poem. In some cases the age at death is approximate. It exhibits the usual bias of this type of information. Only two very young children are listed, a son and a sister. There are very few small children included, yet many of the relatives must have seen their infants die. On the other end the number of the aged is probably too great. It was easier to remember a grandfather who had lived into Ausonius' time than a grandmother who had died earlier. Still it seems remarkable that of the group of thirty-five at least four lived past eighty years of age. Likewise, the number of persons dying between fifteen and thirty is high. The similarity between these results and those of the life tables is partially due to the fact that both Ausonius and the epitaphs are celebrating the dead.

3. MEDIEVAL EVIDENCE

The material for the study of expectation of life is greater for England than for any other medieval country but it begins only in the middle of the thirteenth

[19] *Ibid.*, 383.

[20] Ausonius, trans. H. G. E. White, London, 1919.

[21] Ausonius, I, xx.

TABLE 32

AGE AND STATUS DISTRIBUTION OF SERFS OF ST. VICTOR, MARSEILLES

	Male	Uncertain	Female		Life table distribution	
Ad uber		29				
Age 1			1			
Age 2	1		5	35+29=64		84
Age 3	7	2	6			
Age 4	7	1	5			
Age 5	6	6	21			
Age 6	2	2	8			
Age 7	4		4	69		69
Age 8	9	1	4			
Age 9			2			
Age 10	8	1	7			
Age 11	3		3			
Age 12	1					
Age 13	2		3			
Age 14	1			29+36=65		65
Age 15	1		3			
Filii-filie	18		18			
Ad scolas	6					
					15–19	62
Baccalarii,e	112		112		20–24	56
Married	114		114		25–29	50
Clergy	4				30–39	80
Unmarried	33		23		40–49	58
					50–59	37
	352*	29	338		60–69	17
					70–79	6
					80–99	4
						588

* Includes the 13 given as infantes without notice of sex.

	Men	*Women*
Ad requirendum	26	10
Cum infantes (sic)	15	35
	41	45
	86	

Source: Guérard, B., *Cartulaire de l'Abbaye de Saint-Victor de Marseille* 2: 633–656, Paris, 1857. The life table distribution starts with the numbers 69 for the 5–9 age group and 65 for the 10–14 group and adjusts proportionately from the 1276–1300 table for England. Russell, *BMP*, 181.

century. It consists of information in the inquisitions post mortem and proofs of age. The date of entry into inheritance gives the age of heirs below thirty within a year or so of the exact age while for thirty and above the variation is somewhat greater. However, a majority of the heirs are of the younger age. Then the date of death is given exactly. As a result the information about these many thousands of persons provides the most accurate information with which one has to deal in this period.[22] The bit of French evidence is of the serfs of the abbey of St. Victory of Marseilles in the ninth century. At the end of the Middle Ages the Polish gentry show an expectation of about 18.1 years at age fifty, somewhat better than that of the normal medieval expectation.[23] A certain amount of scattered evidence comes from late medieval Italy.

For the middle period of the Middle Ages the one possibility of constructing a life table is in the data about the serfs of St. Victor of Marseilles. This record presents the rights of the abbey in the people rather than in the holdings. For instance the term *ad requirendum* presumably means that the person is off the place with permission of the abbey and can be recalled.[24] This is assumed to be true of even daughters (without name of husbands) who are said to have children or with children who are not named or described. If, however, the children of a person are described, the persons are considered to be on the holdings even if the husband or wife is said to be *extraneus*.[25] Otherwise the text is sometimes difficult to interpret. For instance, should the *ad requirendum* be applied to the name immediately ahead in a series or to the whole series?

The life table set up in table 32 is compared with

TABLE 33

EXPECTATION OF LIFE IN MEDIEVAL ENGLAND

Age	Born before 1276	Born 1276–1300	Born 1301–1325	Born 1326–1346	Born 1346–1375	Born 1376–1400	Born 1401–1425	Born 1426–1450
0	35.28	31.30	29.84	27.22	17.33	20.53	23.78	32.75
1	39.96	35.76	34.47	31.73	23.65	26.65	28.65	37.04
5	39.87	35.65	34.59	32.25	26.52	28.48	29.41	36.62
10	36.32	32.16	30.95	28.11	25.1	24.48	29.68	34.49
15	32.74	28.62	26.82	25.1	25.18	22.87	29.39	30.89
20	28.74	25.19	23.80	22.13	23.86	21.45	29.38	27.7
25	25.56	23.47	21.36	20.98	22.89	22.54	27.5	25.54
30	22.8	21.8	20.	21.09	21.97	22.29	25.	24.13
35	19.8	19.19	16.69	19.37	19.51	20.21	22.43	21.7
40	17.83	16.61	15.72	17.68	18.14	19.17	19.27	20.44
45	15.51	14.78	13.93	16.14	16.19	16.18	16.58	18.09
50	12.7	12.25	12.45	14.29	15.95	14.27	14.16	16.39
55	10.82	10.52	11.3	12.4	13.99	11.6	12.22	14.1
60	9.42	8.3	9.29	10.81	10.9	9.98	10.47	13.71
65	7.93	7.81	8.06	8.35	8.3	8.7	8.75	12.3
70	6.93	6.29	7.02	6.92	6.77	6.32	7.33	10.49
75	6.35	4.37	5.42	5.54	6.29	4.75	5.4	8.64
80	5.18	3.75	4.5	6.	4.67	3.12	4.85	7.9
85	5.	2.5	2.5	3.33	4.	2.5	3.6	5.62
90	5.			2.5	2.5		2.5	3.69
95	2.5							2.5

Source: Russell, *BMP*, 186.

[22] Russell, *BMP*, chs. V, VIII, IX.

[23] *Przeglad Statystyczny* 1: 342, 1938 (summary in English).

[24] See table 32. The editor (1: xiii) gives another explanation, suggesting that information was not available and was to be sought.

[25] Instances: "Guntardus cum infantes (*sic*) suos ad requirendum" (p. 634); "Maria filia, marito extraneo, cum infantes suos" (p. 642); "Unaldus, cum infantes suos, ad requirendum" (p. 644); "Abent illi homines de illo comite nostras feminas" (p. 650); "Dominica, filia, marito estraneo, est ad requirendum" (p. 653).

the generation life table of England of the group born 1276–1300. The adjustment is made taking the numbers of serfs of ages five to nine and ten to fourteen as the norm and fitting for the rest. The great problem is the group known as the baccalarii and baccalarie, presumably the age group fifteen to twenty-four. Instead of the 118 which the comparative number offers, the baccalarii-e actually number 224. Now the group *ad requirendum* has about the proper number, 86. It would seem then that the abbey permitted a considerable number of the children of the serfs to leave. Presumably as in thirteenth to fourteenth century England, they paid a fee for the privilege.[26] In their place the abbey hired somewhat more than twice their number to work. It would appear that the hiring of unmarried persons was a remnant of Roman slavery where the celibacy persisted long after the slavery itself had disappeared. The monastery would seem to be pursuing a very conservative policy. The alternative would be to break up some of the land tilled by the baccalarii and divide it into family holdings.

The oldest information about division by age in medieval Italy comes from the city of Treviso in the year 1384.[27] The data are as follows:

Males older than 14 years	1451
Males under 14 years	400
Religious	135
Servants (Famuli)	165
Total	2151

For purposes of comparison the religious and the servants should probably be omitted since such groups usually come from outside of the city. Normally the number of people under fourteen years of age should be about half of those over fourteen years of age. In this case instead of 400 there should have been at least 725 in the below fourteen age group. Beloch suggests that the number of children is incomplete and that the very young have certainly been omitted. This is probable but nevertheless the number probably does illustrate the heavy mortality in the Black Death.

Much more detailed information comes from Pozzuoli of the year 1489 and Sorrento of 1561. Here the information is divided by age to the year and by sex. The data are shown in (table 34).

The Pozzuoli evidence shows a very high percentage of children in the population. Actually about 40 per cent of the population is below the age of fourteen instead of the customary third. This should indicate a rapidly increasing population. On the other hand the same age group at Sorrento numbers only about 30 per cent. Here the number of children in the first year of life is much too small and should probably be about forty to fifty. Even at Pozzuoli the number of the infants seems too low. By 1561, if Sorrento is a fair example, the population would seem to be fairly well stabilized by age and by sex.

TABLE 34

AGE–SEX DISTRIBUTION, POZZUOLI, 1489 AND SORRENTO, 1561

Age	Pozzuoli, 1489		Sorrento, 1561	
	Male	Female	Male	Female
0	28	19	13	7
1–4	164	153	161	169
5–9	200	160	149	167
10–14	214	142	119	141
15–19	176	139	171	153
20–24	134	111	151	111
25–29	108	82	153	120
30–34	111	54	112	103
35–39	50	58	106	90
40–44	79	59	87	98
45–49	31	20	56	62
50–54	35	51	59	58
55–59	11	11	41	39
60–64	30	32	51	54
65–69	4	5	25	38
70–74	15	21	11	6
75–79	0	2	9	11
80–89	3	9	7	5
90–99	1	3	0	3
100+	0	2	2	0
Total	1,394	1,133	1,483	1,435

Source: Beloch, *BI* 1: 28–33. The assumption is that the figures in Beloch's table are correct except for the total.

In 1509 the people of Venice were divided between the useful (*utile*) and the useless (*inutile*). The useful were the men between the ages of fifteen and sixty who were in condition to fight. The useless included all of the rest (table 35). The census is valuable in showing the percentage of a city which might be considered in this category. Unfortunately only three of the city districts were included and thus the total population is not given. In 1552 another census was taken of which the full return remains.

Men	49,181
Women	57,322
Children	49,923
Total	156,426.

Venice had more women than men in 1552 if the boys and girls had the same age range. This is, of course, quite typical of modern large cities.

The percentage of those available for military service in Venice may be compared with similar figures for certain cities of northern Europe. Freiburg-i-Ü in the year 1447 had about 22 per cent of the population in this category, while Nürnberg in 1431 had 26 per cent. Ypres had about 24 per cent in the fifteenth

[26] Russell, *BMP*, 67.

[27] Beloch, *BI* 1: 24 citing Angelo Marchesan, *Treviso medioevale*, xv, Treviso, 1923.

TABLE 35

VENICE, 1509, USEFUL AND USELESS MEN

Useful (men)	13,134	32.6%
Useless (men and women)	27,190	67.4%
Total	40,324	

Source: Beloch, *BI* **1**: 38–40.

century.[28] These figures are thus somewhat lower than those of Venice. In northern Europe it would seem that the sex ratio was lower, as we know it to have been, than in the Italian cities of the period. This does not seem to have been true for the ancient period. According to Dionysius of Halicarnassus the number of men in the Roman census should be multiplied by four to get the figure for total population: these men were of military age.[29] Caesar thought that the fighting men of the Helvetii also numbered a fourth of the population.[30]

4. SPAN OF LIFE

The length of life as shown in the tables was low, but, if one did survive the first thirty years, he might reasonably expect to live a fairly long time. The experience of those who did live does not show too early aging. Look, for instance, at the ages of man as defined by Isidore in that famous encyclopaedia of knowledge which served the Middle Ages.[31] These ages were six:

Infantia	infancy	0– 7
Pueritia	childhood	7–14
Adolescentia	adolescence	14–28
Iuventus	youth	28–50
Gravitas	maturity	50–70
Senectus	old age	70–

This pattern is curious in the prolongation of youth until the fiftieth year. There is also an absence of a middle age from the Middle Ages.[32] This scheme was an elaboration of Tertullian's statement that there were five ages as above, omitting only *gravitas* but he mentions no years and indicates that an octogenarian was not unusual.[33] Isidore's statement was quoted almost verbatim by Rabanus Maurus.[34]

[28] IX Hist. Congress, *Rapports*, 61. This assumes that persons twelve years and older would be about seventy per cent of the total population.

[29] Dionysius, IX, 25.

[30] Caesar, *B.G.*, I, 29.

[31] Isidore, *Etymologiarum sive Originum Libri XX*, xi, ii, 1–8.

[32] There is a good study of medieval attitude toward age by A. Hofmeister. Puer, Iuvenis, Senex, zum Verständnis der mittelalterlichen Altersbezeichnungen, *Papsttum und Kaisertum*, etc. Paul Kehr zum 65 Geburtstag dargebracht, 287–316, Munich, 1926. On old age see also Coffman, G. R., Old age from Horace to Chaucer, *Speculum* **9**: 247–277, 1934: McKenzie, K., Antonio Pucci on old age, *ibid.* **15**: 160–185, 1940.

[33] Tertullian, Migne, *Pat. Lat.* **2**: 746.

[34] Rabanus Maurus, *De universo*, VII.

The span of life is the longest age attained by persons of the period. Normally they must have had splendid constitutions, avoided infection, and been well adjusted to their environment. An interesting group, the pillar saints, seems to offer a chance to study the possibilities of the span of life then. Few of them died younger than seventy and many lived far beyond the "three score and ten." While a few of them began their pillar careers early in life, most of them[35] seem to have started between the ages of twenty and forty-five. Instead of living to between fifty and sixty-one, their normal expectation, most of them survived far beyond these ages. One can, of course, believe that their longevity was miraculous, but it is equally probable that there were natural causes of the phenomenon.

The pillar saints were men (and a few women) who spent years upon the top of pillars in the interests of their religious life. They lived, for the most part, at the eastern end of the Mediterranean from the fifth to the eleventh centuries. They form an unusual chapter in the history of religion. This chapter began with St. Simeon the Elder or Simeon Stylites (the pillar dweller). After trying various forms of solitary religious experience which gave him a reputation for sanctity and drew unwelcome crowds about him, he adopted the idea of living upon a pillar, eventually raising it to above fifty feet in height. Around the pillar top was a balustrade: the platform was reached by a ladder which was set against the pillar when anyone wished to climb. Thus St. Simeon, who lived from A.D. 389 to 459 attained a certain isolation amid the crowds at the base of the pillar. His example was followed in the East, but the Roman Catholic Church frowned upon the practice and it never gained a foothold in the West.

One important physical factor was the isolation of these saints from those ordinary human contacts which expose people to contagion. While they did occasionally permit persons to come up the ladder to the very top, this permission was seldom given. Most visitors apparently ascended no higher than the top rung of the ladder: many indeed did not have the courage to climb that high even with the encouragements of a saint at the top. The ladder did not rest against the pillar except when in use. This should probably have prevented rats from climbing the pillars, bringing the bubonic plague with them. The saints lived on a minimum of food so that there was little incentive for rats to climb anyhow. Sick persons were frequently brought to the base of the pillar in order that the saints might heal them, but they were some distance below the saints. Since contagious disease was probably the greatest factor in mortality then, its absence permitted the saint to live much longer than the average citizen of those centuries. The elimination of such diseases

[35] For evidence about these saints see the standard encyclopaedias.

TABLE 36

SOME ITALIAN CITY MORTALITY RATES, 1496–1619

City	Years	Mortality rate (per cent)
Mantua	1496–1510	3.0
Venice	1563, 1569, 1573	3.1
Modena	1575–1589	3.6
Modena	1605–1610	2.6
Genoa	1581	2.53
Genoa	1597	2.86
Genoa	1608	3.57
Palermo	1600–1609	3.3
Palermo	1610–1619	3.1

Sources: Beloch, **1**: 66–67, except for Genoa; Felloni, G., *Archivio Storico Italiano* **110**: 242, 1952.

must have made the survival of the saint largely a matter of his endurance in the environment of the pillar.

As mentioned earlier, the saints lived on platforms on tops of the columns, sometimes two or three. Occasionally they were partially protected by shelters erected on the platform: this seems especially true of pillars erected in the more rigorous climates. Nevertheless, the saints were largely exposed to the elements, the heat of the summer sun, the cold of the winter nights, and rain at all times. The story of a terrible icy gale blowing the clothing off of St. Daniel leaving him more than half frozen is lurid in its details. Yet apparently the era A.D. 400–1100 was warmer than at present, and the saints appeared in territory as far south as the latitude of Florida and north as that of New York, most of them in areas similar to Florida.

Constant exposure to the elements must have inured them to the climate, or they would not have lived so long. They were protected by clothing often of leather and by their hair, usually never cut. At his death the above-mentioned Daniel had hair four cubits in length (six feet) and beard of three cubits. Their only serious occupational hazard was danger from lightning which killed at least one of them.

They were apparently well adjusted to their human environment. Their wants were few and cared for by zealous attendants and followers who lived about the pillar. Occasionally they enjoyed great prestige. Great crowds flocked to hear them preach, to ask their blessing and to be edified spiritually by the sight of the holy men. Great personages frequently asked their advice and acted upon it. Some of them had a powerful sense of social justice, urging their audiences to help the poor and even the criminals. They participated in the theological controversies which were the main intellectual interests of the time.

They constitute then a real case study in longevity. Even in those centuries men might live from seventy to one hundred years depending upon their constitutions. St. Luke the Stylite lived beyond the century mark.

5. MORTALITY RATES

Expectation of life is closely bound up with death rates since death ends the survival and limits the expectation. The few available total death rates come from the end of the Middle Ages (table 36). These death rates are rather low in comparison with the eighteenth-century rates which range about 4 per cent. However, the population of Italy had increased greatly by that time. Heavy density of population seems to increase mortality rates. Epidemics of the plague occurred during the following years in Italy:[36] 1348–1350, 1360–1363, 1371–1374, 1381–1384, 1400, 1422–1425, 1436–1439, 1447–1451, 1477–1479, 1485–1487, 1522–1530 and 1575–1580. Thus the high Modena rate falls within a plague period while the low Genoa rate of 1581 followed a plague period.

The high Modena rate of 1575–1579 thus fell within a period of plague epidemic in Italy and gives some indication of what could be expected under those conditions. The rise of death rate along with increasing population from the sixteenth century into the eighteenth century gives the impression that rates for the medieval period could have been even lower than the thirty a thousand for the sixteenth century. With these rates may be compared the rates derived from the life tables of the medieval period. Since the infant death rates are hypothetical the question then is to find whether the life table rates are reasonable under the circumstances. Of course there may well have been a difference between rates for England or the other parts of the Roman Empire outside of that country.

TABLE 37

ANNUAL DEATH RATES BASED UPON LIFE TABLES

Roman Life Tables			British Life Tables		
Area	Expectation in years	Annual death rate	Time or persons	Expectation in years	Annual death rate
Rome, male	15.3	6.5	Royal family	30.7	3.3
Rome, female	16.3	6.1	To 1276	35.3	2.8
Latium	14.5	6.9	1276–1300	31.3	3.2
Calabria, etc.	24.6	4.1	1301–1325	29.8	3.4
Brutii, etc.	24.6	4.1	1326–1348	27.2	3.7
Aemilia, etc.	28.4	3.5	1348–1375	17.3	5.8
Gaul, Cisalpine	20.7	4.8	1376–1400	20.5	4.9
Gaul, Narbonne	23.0	4.3	1401–1425	23.8	4.2
Iberia, male	35.3	2.8	1426–1450	32.8	3.0
Iberia, female	30.2	3.3			
Africa, male	42.9	2.3			
Africa, female	40.7	2.5			
Asia, etc.	29.2	3.4			
Egypt	28.7	3.5			

The annual death rate is secured by dividing the expectation in years (tables 17–30) into one hundred.

[36] Beloch, *BI* **1**: 68.

TABLE 38

SOME LATE MEDIEVAL INFANT AND CHILD MORTALITY RATES

Age interval	Nobility, 1500–1599		Exeter, 1563–1600	North Elmham
	Number	Per cent		
0	41	19.3	11.7	17.8
1–4	23	7.7	6.5	
5–9	21	3.7	5.9	
10–14		2.0		
10–19	24		6.9	

Sources: Nobility, Peller, S., Studies in mortality since the Renaissance, *Bull. Hist. Med.* **13**: 455, 1943; for Exeter, Pickard, R., *The population and epidemics of Exeter in pre-census times*, 81, Exeter, 1947; for North Elmham, Morrell, C. C., Tudor marriages and infantile mortality, *Jour. State Med.* **43**: 173–181, esp. 180, 1935.

While an infant death rate can be estimated if total death rates and life expectation are available for other ages, direct evidence is naturally more satisfactory. Some remain for a few years after the end of the period in which we are interested. (table 38). The nobility obviously fared worse than the people of Exeter in the sixteenth century. It should be remarked that the nobles fared even worse in the seventeenth century than in the sixteenth, a warning against expecting a continuous increase in length of life over the centuries.

The picture of length of life is typical of the world before the advent of modern science. The average length of life was about thirty years, but if one could survive the first thirty years he had a fair expectation of life. Some, indeed, lived to great old age. The expectation was apparently highest in the thirteenth century although it was remarkably high in the late fifteenth in England and there are the curious data about North Africa in Roman times. The mortality was very heavy for women in the Roman Empire, particularly in the childbearing period. It was also high then for men from twenty to thirty, probably the result of tuberculosis.

The mortality produced a definite pattern by age. Half of the people were less than eighteen to twenty-two and a third under fourteen. At the other end a negligible proportion were over seventy years of age. The incidence of death was high under these circumstances. If a family had six children it would have to expect that the first would die as a baby, second by twenty, the third by thirty-five to forty, the fourth by forty-five to fifty, the fifth by sixty and the sixth later. However, this was under the best of conditions: in time of plague the children disappeared much faster. It would require about six children to the family to replace the dead under good conditions. In time of plague it required at least nine. They were too many: population naturally declined then.

IV. DISEASE

Disease is, of course, the great enemy of population. Its normal incidence set up a definite pattern of population by age which was set out in the last chapter. The unusually severe epidemics would add another problem to determining population. Fertility in the period was sufficient under normal circumstances to offset the ordinary disease and, indeed, medieval man tended to restrict numbers by permitting marriage only to those who had the means to support families.[1] However, very serious epidemics, such as the *lues* of the second century and the Black Death of the sixth and fourteenth centuries,[2] cut so deeply into the population that it required generations to reach again the pre-epidemic numbers.

It is doubtful whether medical care helped very much in the battle against disease. The life tables for the period of the Roman Empire show a shorter life (except for North Africa) than do those of thirteenth-century England but are better than most of those for the plague-ridden second half of the fourteenth century.[3] After all, the doctors could only diagnose the disease and prescribe simple remedies based, for the most part, upon quite wrong premises. They did not know what caused disease, let alone how to cure them. Even the easily observed technique of the rest cure for tuberculosis escaped them although they were supposed to have developed a good clinical approach to patients. They did not know that it was important to preserve cleanliness about their patients. Thus medicine had little more effect than that of bolstering the confidence of patients.

Yet if the person could escape the infection or bacteria he had the usual span of life. Medieval man was apparently not biologically inferior to men today. This is the significance of the study of the pillar dwellers, the Stylites, who provided a kind of laboratory for this peculiar experiment.[4] On the tops of their columns they lived unbelievably long lives in, as we shall see, a rather unfavorable climatic period. The very warm weather which stimulated certain disease organisms made it more comfortable for those who dwelt on the pillars. The human constitution probably differed little from ours: the upper limit of age of those who survived the diseases and wore out was about one hundred years, as it is today.

The improvement which may appear in the thirteenth-century life tables over earlier Roman tables (including one from Roman England) is probably the result of development of immunity from ordinary diseases. Even here one must be cautious in his conclusions. The most dangerous endemic disease was almost

[1] Chapter XI, especially section 2.

[2] The most accurate definition of population decline under the impact of the Black Death is in my *British medieval population*, 214–232.

[3] Russell, *BMP*, chs. VIII, IX; above chapter III.

[4] See pp. 33–34 above.

certainly tuberculosis. Against the "white plague" immunity is developed only gradually since there is often as long a period as twenty years between infection, usually in childhood, and breakdown from the ages of fifteen to thirty-five. Then many who have little immunity against it have children. It is possible that other factors, such as change of climate, might be responsible for less disease. In the case of tuberculosis the chilling of the climate from about A.D. 700 to 1200 might have been less favorable for that disease.[5] Another is the change through alteration in density of population and the resultant change in the chance of contagion.

The decline of population in the later Roman period in the west and in part of the east relieved for a time the dangers of contagion resulting from density of settlement. From about A.D. 1000 the increase in population particularly in central and northern Europe must have made the problem of contagion worse. The piling up in cities made direct communication of disease from person to person easier and indirect communication through contamination of water supplies more likely. The menace to health in the large city and even in the surrounding countryside is well illustrated by the shortness of life in Rome and Latium apparently in the life tables of those areas.[6] The people were aware of the value of a "good" water supply but goodness naturally meant in taste rather than in freedom from sources of disease.[7]

The situation in the villages was often not much better. If the village spring or well was above the village level or was protected in some other way its purity was naturally health giving. However should it be subject to contamination the whole village was at its mercy.[8] Usually the houses were fairly close together. Animals and insects circulated freely among them. Ancient and medieval life was a community-loving life. It was protected from the dangers of contagion only by the lesser density of its population. This danger was the price it paid for avoiding loneliness for few families cared to live in isolated homesteads, in part because it gave a reputation for queerness.

The folk were also at the mercy of the climate,[9] especially since it changed greatly in the period and thus forced the people to adjust to it. Until recently scholars doubted that the climate did change. The classical period did have a climate much like ours. Furthermore, the Mediterranean, dominated by vast stretches of water and well to the south, experienced less change than did the area farther north. However, the obvious warmth of climate in the last generation and the historical uncovering of great changes in the late medieval period have caused opinion to change.[10]

The most striking change was the very cold age at the end of the Middle Ages following the relatively mild central age,[11] the beginning of the "Little Ice Age." The spread of ice southward from Greenland and Iceland was paralleled in time by increasing chill throughout Europe, rivers covered with ice for longer periods, and later harvest seasons. This made life more difficult beginning from the north. However, it seems to have provided a more stimulating atmosphere for the Mediterranean area which had suffered in the early Middle Ages from the warmer climate of that period. In that age olives grew in England, figs in the range of the Carolingian demesne and camels seemed at home in southern France.[12] Unfortunately, southern Europe in this warmer age endured more malaria and tuberculosis and saw the spread of leprosy.

The evidence for rainfall and moisture is not so clear as that of temperature. However, the warm weather of the early part was apparently accompanied by generally arid spells and the chill at the end by dampness.[13] Yet there were notable exceptions and the cycles of wet and dry weather were fairly short. The second half of the sixth century seems to have been especially damp while the thirteenth century saw much very dry weather. The central period is much more difficult to define, in part because the data are not so abundant. Because of its smaller range, dampness seems to have had less effect upon the history of the period than did temperature.

A third factor of climatic importance is the winds, the result of changes of pressure. The existence of windy and stormy weather is considered very stimulating to human energy.[14] Now the later medieval period seems more stormy than the present while [15] the early Middle Ages seem to have been calmer. But the combination of cold, damp, and windy weather is, even if stimulating, rather unhealthy. A part of the problem was caused by the fact that such large urban communities had never faced such cold, windy, damp weather before. Perhaps that combination was re-

[5] Mills, C. A., *Climate makes the man*, ch. 4, New York, Harper, 1942.

[6] See tables 21, 22, 29.

[7] Vitruvius, *Architecture*, I, iv; VIII, i, ii, iii, and especially iv. He gives no instructions for real safeguards against infection of the water supply.

[8] There seems to be no good study of sites of springs and wells with respect to housing. The instructions of Vitruvius consider merely the problem of how to get water. He was aware (VIII, vi) of the danger of lead poisoning.

[9] For the subject of climate see my forthcoming study on it.

[10] For a recent popular statement see Brean, H., What's happening to the weather?, *Readers Digest*, November, 1956, 125–130 reprinted from *Life* (August 27, 1956).

[11] Pettersson, O., Climatic variation in historic and prehistoric time, *Svenska Hydrografisk-Biologiska Komm. Skrifter* **5**, 1914. He made more of an impression with regard to climatic change than he did with regard to his theory of the cause of the change: great tides under the surface of the ocean.

[12] The evidence is in my forthcoming study.

[13] *Ibid.*

[14] Huntington, E., *Mainsprings of civilization*, 328–342, New York, 1945.

[15] *Ibid.*, 599–607.

sponsible for the serious epidemics which make the end of the Middle Ages so unhealthy.

The whole question of climatic determination depends upon a variety of interpretations. There are some who feel that it is a very vital factor in human development.[16] For the Middle Ages relatively little attention has been given to it. As a result there are few criteria considered and even few hypotheses advanced with the respect of adjustment of man to climate. The problem is merely stated here. Disease is considered largely in an effort to place it properly in the demographic history of the late ancient and medieval period.

1. LATE ANCIENT EPIDEMICS

Well-known passages in the chronicles record a great epidemic (*lues*) in the second half of the second century. It was apparently brought back from the sack of Seleucia in Mesopotamia in 166 by the army of Verus (younger associate of Marcus Aurelius) and covered a vast area of the Empire.[17] As usual, an interesting legend was built up as to its origin. The epidemic appeared even at Rome where it was raging in 172 and was still there at the time of the death of the emperor in 180.[18]

The chronicles reported that thousands were killed by this plague. At Rome as many as 2,000 a day were said to have died.[19] Since Rome had about 200,000 at the time, the estimate, if accurate, indicates a very heavy mortality. Indeed, Dio Cassius labelled it the worst mortality known to him. It does not seem to have been identified, even by the great physician, Galen, as other than a plague. Of course, its virulence suggests the bubonic plague but its appearance in 172, so soon after 166, does not follow either its sixth- or fourteenth-century pattern which saw a much longer interval between the first two plagues.

The extent of the mortality has been confirmed with respect to Karanis and other communities in Egypt[20] by Professor Boak. Papyrus documents would show that between A.D. 144–146 and 171–174 the number of persons in that city of about two to three thousand decreased by a third. This is as severe a decline as was produced by the bubonic plague in fourteenth-century England. While this is only a small sample it is the more convincing since it comes from an area in the east where, if anywhere, an immunity might have been raised against it.

This is indeed sufficient mortality to account for the whole decline of Roman population from the time of Augustus to the fourth century. However, study of the late medieval English plague showed that the survivors of a plague period were longer-lived than even a healthy pre-plague group.[21] Presumably the plague eliminated both those who had no immunity to the disease and those who had little immunity against any disease. This should have produced at least a slight recovery in population: enough so that the third-century disturbances can be credited with at least a minor population decline of its own.

The third century saw another series of plagues occurring in the years 251–268.[22] The nature of the disease is not clear: presumably it was the same that had caused such havoc in the preceding century. It seems to have been especially severe about the year 262 when it was prevalent in Italy and Africa. This time it was alleged that five thousand died each day at Rome for a period. As before it was thought to have come out of the east, this time from Egypt. It is possible that the warming of the climate of the Mediterranean made it easier for the warmer weather diseases to become epidemic in the area.

The two great plagues of the second and third centuries would probably be enough to account for the population decline of much of the Roman Empire from the time of Christ to the middle of the fourth century. The effort to recover the lost population was frustrated probably by the low marriage rate and indifference to raising children which was characteristic of the period. While economic conditions were bad in the third century as a result of taxes and wars, these alone were not sufficiently serious to prevent population recovery. There were two very destructive diseases, tuberculosis and malaria, which continued throughout the period with varying effect but which tended to keep population from increasing rapidly.

2. TUBERCULOSIS

In the chapter upon expectation of life the expectation of the age group from fifteen to thirty-five provides some indication of the prevalence of tuberculosis. That disease is one of the few which strikes more heavily at that age than at any other. It thus is reflected well in the mortality of that age group. There is no very good study, however, of the disease in antiquity and in the Middle Ages. The evidence for it exists in some quantity and can be compared with the information known about the disease. It can be related to conditions then which both discouraged and assisted in the spread of the disease. It is known, for instance, that the disease is carried mostly to the very young in whom the disease appears years later usually in the late teens

[16] *Ibid.*, Mills, C. A., *Climate makes the man*, New York, 1942.

[17] *Scriptores Historiae Augustae.* Vita Marci 28.

[18] Vita Marci 13 and 21. Ammianus Marcellinus, XXVI, vi, 24; Vita Veri VIII, 1–2.

[19] Dio Cassius, LXXIII, xiv, 3: Vita Marci 13.

[20] In a study being prepared by Professor Boak: see also his The population of Roman and Byzantine Karanis, *Historia* **4**: 157–162, 1955.

[21] In Russell, *BMP* compare table 8.3 with table 8.10.

[22] Parker, H. M. D., *A history of the Roman world from A.D. 138 to 337*, 163, 165, 170, 176, 182, and 190–191, New York, 1939. The sources are Zosimus I, 37, 3 and *Vita Galli* 5.6.

and twenties, usually also from one case to a number.[23] It seems also that humanity gradually builds up an immunity against the disease through the deaths of those who have it.[24] This is a slow but certain process. One problem is to discover the stage at which the disease existed in the period.

It is possible that tuberculosis appeared earlier among the Indians and the Chinese than among the Hebrews and Egyptians.[25] Much of the best evidence about the disease comes in the works of Hippocrates several centuries before Christ in Greece. It seems to show also that the disease was a relatively new disease there since the symptoms which he offers are those of epidemic character, the old "galloping consumption." Any disease in a population unused to it is apt to have an epidemic character. Hippocrates says that the favorite age is from eighteen to thirty-five and that the symptoms are violent and usually mortal.[26] He mentions that after a dry summer with northerly winds and a rainy autumn with southerly winds tuberculosis followed sometimes in the winter.[27] It tended also to follow a semi-tertian fever.[28] This indication of the fatality of those who combined tuberculosis with malaria is an important factor in the information about mortality.

It is fortunate that the description by Hippocrates remains because the next good medical evidence comes from Celsus in the first century A.D. He knows more about it even though some of his suggestions are not very satisfactory. He says that it often follows pleurisy[29] but apparently he does not regard it as an epidemic disease. In three long passages he discusses the condition of one recovering, the proper treatment, and the signs of approaching death from the disease.[30] In the first the most favorable sign was lack of fever. In the second he suggests a long sea voyage, or if this is impossible, rocking in a boat. Milk, sleep, and rest are urged although for incipient tuberculosis elsewhere he suggests heavy exercise,[31] a rather lethal suggestion. It seems obvious that the disease had reached a stage where it was not so fatal as in the time of Hippocrates. It is at this stage that the death rate by age can be examined for evidence of the effects of the disease at this time.

Tuberculosis is an unusual disease in that it does not pass through a definite course involving the whole system in a few days or weeks. Attacking at one or more places it may follow one of three patterns: be overcome by the human system, attain a chronic and stationary position, or spread until it causes death. Thus the strength of the system plays a vital part in survival. Resistance to tuberculosis seems to be inherited much as other hereditary characteristics. Now long contact with the disease should tend to raise resistance to it and to postpone mortality so that the peak of the death rate from the disease should fall later. That this is true may be seen in table 39 where the death rates for whites and Negroes are compared for 1911–1915. At this time the whites had been subjected to the disease for centuries while the Negroes in the United States seem to have been in contact with it only since they were imported from Africa. The high point for Negro mortality from tuberculosis is 20–24 while that for white women is 25–34 and white men 35–44.[32]

The problem of using the relative data from whites and Negroes is complicated by the social and geographic differences between the two. It has been suggested that the Negro death rate would not be different from that of a white group of similar characteristics.[33] The difference in death rate between white men and white women is probably the result of heavy manual labor by more men than women. Since Negro women as a rule also do heavy manual labor it is not surprising that the death rate for them is also very high. On the other hand the death rates for the country are notably less than for the city: here the preponderance of Negroes in the country should have affected their death rate favorably,[34] except that they live in hot moist areas which are supposed to be worse for the disease.[35] All in all, there are problems here to be solved. It is clear that the presence of great numbers of Negroes in a population changes the tuberculosis rate significantly.[36]

Another factor of significance detected for tuberculosis mortality was hours of sunshine as a favorable element.[37] The warmth of the early Middle Ages and the low level of moisture should have produced conditions not favorable to high tuberculosis mortality since even the height of temperature did not give the Mediterranean a tropical climate, much less the territory of northern Europe. Furthermore, it has been pointed

[23] Downes, J., How tuberculosis spreads in a rural community, *Amer. Jour. Public Health* **26**: 30–36, 1936.

[24] Downes, J., The effect of tuberculosis upon the size of the family, *Milbrook Memorial Fund* **17**: 1–14, 1939; Cunningham, J., Some factors in racial immunity and susceptibility to disease, *Man* **26**: nos. 104 and 201, 1926.

[25] Wolff, G., Tuberculosis and civilization, *Human Biology* **10**: 106 ff, 1938.

[26] *Hippocrates, Aphorisms,* ed. W. H. S. Jones, at end, London, 1923.

[27] *Ibid., Airs, waters, places,* x.

[28] *Ibid., Epidemics* I, xxiv.

[29] Celsus, *De medicina,* ed. W. G. Spencer, I, 125, Cambridge, 1935.

[30] *Ibid.* I, 135, 325–333 and 143 respectively.

[31] *Ibid.* I, 183.

[32] Dublin, L. I., and A. Lotka, *Twenty-five years of health progress,* 84, New York, Metropolitan Life Ins. Co., 1937.

[33] Bogan, E., Tuberculosis among the relatively neglected group, National Tuberculosis Assoc., *Trans. 25th Annual Meeting,* 275–277, 1929.

[34] Sydenstricker, E., *ibid.,* 266.

[35] Mills, C. A., *Climate makes the man,* 122–123, New York, 1942.

[36] Cowles, A., and E. N. Chapman, A statistical study of climate in relation to pulmonary tuberculosis, *Jour. Amer. Statistical Assoc.* **30**: 517–536, 1935.

[37] Cowles and Chapman, *op cit.* These authors did not find that overcrowding increased tuberculosis significantly.

TABLE 39

DEATH RATES FROM ALL CAUSES AND FROM TUBERCULOSIS, U.S. 1911–1915

Age	White male			Colored male			White female			Colored female		
	all	t.b.	%	all	t.b.	%	all	t.b.	%	all	t.b.	%
15–19	1.98	.62	31	4.86	2.34	48	1.86	.82	44	5.92	3.21	54
20–24	3.04	1.31	43	6.11	2.94	48	2.73	1.22	45	6.28	3.25	52
25–34	4.90	2.05	42	8.33	2.84	34	3.51	1.29	37	6.36	2.38	37
35–44	8.18	2.75	34	9.59	2.86	30	4.80	1.09	23	8.29	1.77	21

Source: Dublin, L. I., and A. J. Lotka, *Twenty-five years of health progress*, 16 and 82, New York, 1937. The yearly rates are multiplied by 5 and changed to a base of 100 instead of 100,000.

out that tuberculosis was one of the diseases whose incidence did not increase in time of the great depression of 1929–1938.[38] Since the economic conditions of the Middle Ages, particularly of the early part, were bad, even this may not have increased the mortality rate from the disease.

Before using general figures about mortality to make an estimate of the influence of tuberculosis it is necessary to show the proportion of mortality which can be assumed to be the result of the mortality of that disease. The figures (table 39) are for the United States in 1911–1915 when the death rate from tuberculosis had already been reduced. Yet even at that period nearly half of the deaths in the years of life from fifteen to twenty-five were the result of tuberculosis. Since Roman life probably suffered from accidents less than did the American, tuberculosis probably was a much larger factor in Roman mortality.

Since the death rates are annual and based upon the 100,000 instead of 100, the two types of rates have to be converted to the same base.[39] The mortality upon the latter basis (100) for the United States thus reached its highest for tuberculosis at about 3.21 per cent and 3.25 per cent for colored women aged 15–19 and 20–24 respectively. The same intervals for Roman Spain (both men and women) were 11 per cent and 16.9 per cent respectively for the total mortality of the group, of which tuberculosis must have been responsible for the greater portion.[40] Now even in the later medieval period in England the mortality for these age groups had dropped markedly except during the time of the plague. It would seem then that European society had acquired gradually a partial immunity to tuberculosis. If data were available they would probably show also that the Jews had acquired an even greater immunity than had their Christian neighbors (as they have today) because the conditions of the ghetto, into which they were forced, produced a more constant exposure to the disease.

It is common demographic dogma that tuberculosis places a heavier burden upon humanity than almost any other disease. It kills just when the long and expensive training for life has been completed, often before the patient has had a chance to contribute to the life of his society. Thus, a culture with a heavy mortality from tuberculosis carries a very heavy burden. Among the Roman provinces of western Europe, Spain had the best record of mortality. Yet even there of ten children who reached the age of five one was dead by fifteen, a second by twenty, another by twenty-five, and a fourth by the age of thirty. It can be seen that it was not easy to keep up the population even under what were probably the best conditions in western Europe.

3. MALARIA

In contrast to tuberculosis whose symptoms are often difficult to detect before the patient is far advanced with the disease, malaria presents early and unmistakable symptoms. The ague or chills which came with such persistent regularity on the second, third, or fourth day left no doubt as to the identity of the disease. The pattern of mortality, if then the same as recently,[41] was the natural pattern of mortality, high for the very young, low for the teens, and rising gradually toward the end of the life. The references to malaria are so many that it has been easy to prepare a volume upon malaria in Greek history alone.[42] It has been possible to suggest an outline of the incidence of malaria in Italy throughout the Middle Ages.[43]

Malaria has received considerable study in modern

[38] Mills, *op. cit.*, 229.

[39] The modern percentage is obtained by multiplying the annual rate for the interval by five.

[40] The total death rate for colored women from fifteen through nineteen was 5.9 per cent: thus the tuberculosis was responsible for somewhat more than half of the deaths. The total rate for the period 20–24 was 6.27 per cent: the tuberculosis was responsible for a trifle more than half of these deaths.

[41] An example from Amritsar in the early twentieth century shows the following mortality at several ages: 8–20 per cent at 0–1; 2 per cent at 4–5; 1 per cent at 10–35; 2 per cent at 40 and 8 per cent at 60. Epidemics merely increased the mortality at each age except for the very young. Here apparently stillbirths reduced the infant mortality. Gill, C. A., *The genesis of epidemics*, 75, London, 1928. See also figures in U. S. Bureau of Census, Vital Statistics, *Special Reports* **1**: 10–11, 1934–1936 and **18**: 14–15, 94.

[42] Jones, W. H. S., *Malaria and Greek history*, Manchester, 1909.

[43] Celli, A., *The history of malaria in the Roman Campagna*, chs. III–VI, London, 1933.

times so that the conditions most favorable and unfavorable to it are known.[44] It is essentially a warm and wet weather disease. The high points of malaria mortality in Italy coincide with the eras of heavy rainfall except for the period about A.D. 800. Malaria was also prevalent in the time of moderate temperature, the middle period, but is low at both the highest and lowest points of the range. It would appear that the period A.D. 800–900 ought to have been a period of high malaria mortality in northern Europe when it was warm and wet. Another factor of importance is the state of tillage. "Well drained uplands and carefully cultivated areas are, as a rule, healthy."[45] Thus, as land was abandoned through the decline of population in the third, fourth, and fifth centuries, the incidence of malaria should have increased considerably. It may have been related also to the number of farm animals since men seem to be attacked only when animals are not available.[46]

Even mortality rates for malaria would hardly reveal the full significance of the disease as a factor in the population. An ancient writer, as we have seen, noticed that the combination of malaria with tuberculosis was particularly fatal; this is not surprising since they were probably the two most deadly of the common diseases. Malaria, by reducing the health of even those to whom it was not fatal, caused many to die of diseases which normally they could have survived. Probably the very terrible mortality rates for Rome and Latium in classical times owe much to the prevalence of malaria in the area.

4. PLAGUE

The most terrible of the epidemics of the Middle Ages was the bubonic plague. It apparently appeared first in the sixth century,[47] remained for more than half a century and then reappeared only in the fourteenth century. It still lingers on in endemic form in a few places[48] and has been subjected to a considerable amount of study. It apparently can appear in three forms: the pneumonic which is directly transmittable and rather rare, the septicaemic, and the bubonic.[49] The third is the most common but must be transmitted through fleas on rodents. The course of the plague then is bound up in the history of both the fleas and rodents. The plague in its first appearance left only fragmentary accounts in the sources but they are enough so that the disease can be properly identified. In this chapter we shall consider the possibility that the first epidemic of the disease followed a course which was roughly parallel to the second, permitting one to assume that the course and effects of the first were approximately the same as those of the second.

The plague seems to have appeared in the sixth century in Egypt and thus may have come from the upper Nile valley.[50] The second plague (of 1348) seems to have come from China where apparently it had become endemic.[51] As mentioned earlier it has its optimum intensity about 20°–25° C. (68–77° F.) average temperature with a humidity of about 60 per cent. In modern times warm, dry areas are virtually free from it.[52] In the sixteenth century it was noticed that, although epidemics occurred at intervals of ten, fifteen, and twenty-five years in North Africa, they did not occur among the tribes of central Africa.[53] It seems, therefore, very unlikely that the semi-nomadic areas in the Middle Ages were affected much by it.

The part of the flea was that of a carrier of the disease. His habits and inclinations doubtless had some share in the curious course of the disease. It is noticed that very marked differences in mortality occurred from place to place, which may be partially owing to the flea. Another question is raised by the low mortality caused by the plague in comparison with the very high mortality of those who have the plague today. One might have assumed that everyone would have been exposed and experienced the plague since it was so universal. A possible explanation of this mystery may be that the flea is highly selective in his choice of human victims and thus only a fraction of a given population is actually exposed to the disease.[54] The high mortality of the plague at certain warm damp seasons may also be associated with the life cycle of the carrier.

The rat obviously is an important factor in the plague.[55] During the Middle Ages the ordinary rat was the black or house rat which preferred to live in the upper floors of houses and thus was brought into close association with the family. This rat also lived aboard ship and helped to carry the disease from one locality to another. Furthermore, medieval houses were generally of wood which enabled the rats to move at will through them. Even the stone houses were easily accessible to these rodents. The rats themselves took the disease and often indicated that they had it by dancing about in the streets. However, medieval medical men never seem to have associated the disease

[44] See below.

[45] Manson-Bahr, P. H., *Manson's tropical diseases,* 6, New York, 1930.

[46] Hackett, L. W., *Malaria in Europe,* 28–29, London, 1937.

[47] It has been suggested that the plague appeared as early as the second century in the time of Galen. Greenwood, M., *Epidemics and crowd-diseases,* 25, New York, 1933.

[48] Mostly in Africa and Asia among men. It is endemic among rodents in the western part of the United States whence it spreads occasionally to man.

[49] See article on "plague" in the *Encyclopaedia Britannica.*

[50] Stein, E., *Histoire du Bas-Empire,* excursus 10, **2**: 841; Seibel, V., *Die grosse Pest zur zeit Justinians I,* Detlingen, 1857.

[51] Kowalewsky, M., *Die Ökonomische Entwicklung Europas* **5**: 222–277, 1911; Gasquet, F. A., *The great pestilence,* London, 1893 and *The Black Death of 1348 and 1349,* London, 1908.

[52] Gill, C. A., *The genesis of epidemics,* 372, London, 1928.

[53] Leo Africanus **1**: 102.

[54] In the summer of 1939 our family returned to our home which had been rented to a family with several animals for several months and was flea-ridden. The fleas had very decided preference for two members of our family, both male.

[55] Donaldson, H. H., *The rat,* Philadelphia, 1924.

TABLE 40

COMPARATIVE CHRONOLOGY OF THE GREAT PLAGUES

14th-century plagues (England)	If plague years of A.D. 1348–1400 were superimposed on A.D. 543–595	6th-century plagues (Europe)
A.D. 1348–1350	A.D. 543–545	A.D. 543–547
A.D. 1360–1361	A.D. 555–556	A.D. 552, 554, 558
A.D. 1369	A.D. 564	A.D. 561, 565
A.D. 1374	A.D. 569	A.D. 566 or 570, 571
A.D. 1382	A.D. 577	A.D. 573–574
A.D. 1390–1391	A.D. 585–586	A.D. 582, 584–591
A.D. 1400	A.D. 595	A.D. 599–600

Sources: 543–547: Victor Tonnensis, *Mon. Germ. Hist. Chr. Min.* **2**: 201; Chron. Saragossa, *ibid.* **2**: 223; Auctarium Marcellini, *ibid.* **2**: 107; Procopius, *Hist. of the wars*, II, xxii–xxiii, VI, iii, 1; *Annals of the kingdom of Ireland by the four masters* **1**: 183, 187, Dublin, 1856; Gregory of Tours, *De gloria confessorum*, ch. 79; *Hist. Franc.*, VI, 5; *Vitae Patrum*, VI, 65; *Annales Cambriae*, 4, London, Rolls Series, 1860. 552: Keyser, *BD*, 300; 554: Hodgkin, *Italy and her invaders* **5**: 35; *Camb. Med. Hist.* **2**: 118; Leeper, *History of medieval Austria*, 78. 558: Agathias, Keyser, 300; Gregory of Tours, *Hist. Franc.*, VI, 31; Miracles of S. Julian, 45. 561: Keyser, *BD*, 300. 565, 566 or 570: Paul the Deacon, II, 4; Hodgkin, *op. cit.* **5**: 166; 571: Marius Ep. Aventicensis, *Mon. Germ. Hist. Chr. Min.* **2**: 238. 573–574: John of Biclara, *ibid.* **2**: 213, 214; *Esp. Sagrada* **6**: 38. 582: Gregory of Tours, *Hist. Franc.*, VI, 14. 584–591: *ibid.*, VI, 33, VII, 1, IX, 21, 22, X, 1, 23; Paul the Deacon, IV, 14. 599–600: Hodgkin, *op. cit.* **5**: 426; Fredegarii Scholastici Chronicon, *Pat. Lat.* **71**: 602.

with either rats or fleas and, indeed, produced a curious account of the origin of it.[56] The mystery of the disaster led many to blame it on Jews or other innocent persons.

[56] See, for instance, the manifesto of the College of Physicians of Paris, printed by Hecker, J. F. C., *Epidemics of the Middle Ages*, 47–49, London, 1859.

The effort to define the pattern of the plague of the sixth century suffers from the lack of good chronicles and other historical material of the time. It is a fortunate accident that the outstanding history of Procopius gives a rather detailed picture of the great plague of the day, making it clear that it had many of the characteristics of the plague of the fourteenth century. He tells, for instance, of the loss of many thousands of lives at Constantinople which, in view of his tendency to exaggerate, should be reduced as an estimate. He describes the symptoms also so accurately that there is no question of the identity of the disease. Now modern study of the plague in India has shown that the warm, dry parts of the country have much less plague than do the damp parts and, in fact, possess an almost complete immunity. Thus it seems probable that the desert and semi-desert areas of the sixth century had a quite modest mortality.[57]

In general it would seem that the sixth-century plague shows the pattern of a primary plague of terrible mortality followed by lesser epidemics at intervals of several years lasting over a period of a half century. The purpose of this comparison is to get a basis for an estimate of the mortality of the sixth-century plague. It is unlikely that the loss of life in that century was less than the mortality of the fourteenth-century plague.[58] As will be seen, the years 1348–1350 saw a very heavy loss of life, 20 to 25 per cent in most European countries. The decline continued with later

[57] Gill, C. A., *The genesis of epidemics*, 372, London, 1928. Procopius (*Anecdota*, xviii, 44) says that the plague carried off half of the population.

[58] The heavy mortality of the early plague has been commented upon. Franz, L., Zur Bevölkerungsgeschichte des früheren Mittelalters, *Deutsches Archiv für Landes- und Volksforschung* **2**: 404–416, 1938.

TABLE 41

EFFECTS OF EPIDEMICS ON MARRIAGES AND BIRTHS, AUGSBURG, AND LONDON

	Births	Weddings	Deaths		Births	Weddings	Deaths
Augsburg							
Three year average 1501–1503	1,837	542	1,724	1508–1510	1,839	519	1,862
Epidemic 1504	3,048	985	4,765	1511	2,897	896	4,870
Epidemic 1505	2,646	648	3,564	1512	1,768	786	2,980
Three year average 1506–1508	1,871	624	1,849	1513–1515	1,918	699	1,774
Augsburg							
Three year average 1518–1520	1,761	386	1,842	1544–1546	1,853	566	1,200
Epidemic 1521	2,970	322	3,895	1547	1,645	630	3,480
Three year average 1522–1524	1,804	382	1,979	1548–1550	1,649	574	1,415
Augsburg				London			
Three year average 1532–1534	1,797	573	1,332	1662–1664	10,678		16,736
Epidemic 1535	1,410	593	13,000	1665	9,967		97,306*
				1666	8.997		12,738*
Three year average 1536–1538	1,518	730	1,506	1667–1669	11,635		17,517

* Plague deaths for 1665 and 1666 were 68596 and 1998 respectively.

Sources: Augsburg, British Museum, *MS Sloan 4,432*, fo. 379; London, Graunt, J., *A collection of the yearly bills of mortality*, London, 1759.

epidemics until the population of about 1,400 was near 60 per cent of the pre-plague figures. Probably the same decline was produced by the sixth-century plague, an initial loss of 20–25 per cent in the first few years followed by a continued decline to about A.D. 600 and to about 60 per cent of the pre-plague total. The low point of population in our period of study was almost certainly near A.D. 600.

The effects of epidemic both of plague and of less serious diseases are illustrated in the demographic returns from the city of Augsburg in the first half of the sixteenth century.[58a] The two-year epidemics of 1504–1505 and of 1511–1512 show in both cases a heavy increase both of marriages and of births in the periods of plague. There was also a marked increase in births during the epidemic year of 1521 although not of 1547. Evidently as those who held positions on farms and in the city died, their places were taken by bachelors who married immediately and had children very soon; in fact it is surprising that the increased marriage rate is reflected so quickly in the number of births. One wonders whether children who had not been baptized before were now brought to the altar. In 1504, for instance, an increase of 445 in the number of marriages produced an increase of over 1,200 in the number of registered births. In any case it seems that the loss in population would be shortly recovered by the increase in the birth rate. The great epidemics of 1535 in Augsburg and of 1665 of London produced other interesting results. There the number of births declined somewhat although they were not too much below the average of the time. In London for one year the death rate was reduced but everywhere else the death rate was actually increased for a few years. It would appear then that the plague and other epidemics not only killed off the people lacking in resistance at the time but left others in weakened condition—probably subject to such lethal diseases as tuberculosis and pneumonia.

Somewhat the same type of result appears in the figures remaining from the 1656–1657 plague of Genoa (table 42), a plague which is alleged, probably with some exaggeration, to have killed 60–70,000 people. Despite the very heavy marriage rate, the birth rate even of 1658 was quite low although the first year of marriage usually produces a high birth rate. Assuming a birth rate of 4 per cent, the population of the parishes before 1657 should have been about 69,025 and after the plague in 1659 about 47,925. This gives a net loss of about 22,000 or about 32 per cent. Correcting for the missing parishes, one estimates the population of Genoa before the plague at about 102,000 and after the plague at about 71,900. The actual loss for the entire city should have been about 33,000.

TABLE 42

EFFECT OF PLAGUE UPON MARRIAGE AND BIRTH, GENOA, 1653–1639

Year	Marriages 23 of 36 parishes	Births 24 of 36 parishes
1655	668	2,761
1656	588	2,688
1657	1,199	1,287
1658	1,334	1,626
1659	634	1,917

Source: Costa, A., La peste in Genova negli anni 1656–1657, *Proceedings*, Rome **1**: 344–372, esp. 368–369.

These figures seem to confirm a statement of Procopius that the plague was particularly fatal to pregnant women. It will be noticed that in Augsburg 1535–1538) and in London (1625, 1665–1666) the births are down not merely for the year of the plague but for the following year or years.[59] It suggests that a fair proportion of pregnant women died and thus failed to produce children in the normal year of birth which would be the following year. The reduction of married women of childbearing age was probably counterbalanced by marriage of single women within a short time. A heavy plague thus definitely seems to leave a deficit of births which was not offset by remarriages. This was, as we have seen, not true of less serious epidemics. Thus the population could not easily be restored from the ravages of the plague, as has sometimes been stated.

The Black Death seems to have struck unevenly in Europe. The kingdoms of Bohemia and Poland were apparently disturbed very little in 1348–1350 and suffered less than others in later plagues.[60] It is possible that Florence and its countryside did not suffer much in the first epidemic. The data are rather interesting. The city and its countryside were divided into four

TABLE 43

FLORENTINE HEARTH TAX RETURNS, 1343–1384

Year	Countryside (hearths)	Outside walls (hearths)
1343	22,599	2,597
1350	31,386	2,356
1356	32,463	2,396
1365	29,313	2,375
1373	30,110	2,421
1384	30,012	2,367

Source: Fiume, E., La demografia fiorentina nelle pagine di Giovanni Villani, *Archivio Storico Italiano* **108**: 94, 115–128, 1950.

[58a] Augsburg itself had only about 12,000 to 15,000 population at the time: see p. 52. The 1,837 deaths of A.D. 1501–1503 should indicate at 4 per cent a total population of about 45,000. The death rate was obviously not much lower. Much of the surrounding countryside must have been included in the vital statistics. See Schreiber, A., Die Entwicklung der Augsburger Bevölkerung, etc., *Archiv für Hygiene* **123**: 100–109, 1940 for a similar approach.

[59] Confirmed by study of modern Indian plagues. Gill, C. A., *Genesis of epidemics*, 343–345.

[60] Höniger, R., *Der schwarze Tod in Deutschland*, 27–39, Berlin, 1882.

districts, each containing a part of the city and a division of the countryside. The returns for only the countryside and the territory immediately outside of the walls remain (table 43): the city returns have disappeared. The 1343 returns suffer from not being an *estimo*, a very carefully collected return. The difference can be seen between the *estimo* of 1365 and the return of 23,587 in 1364. A second possibility is that the country in 1350 may have received many of those fleeing from the city itself. The group just outside of the city wall declined notably and may have reflected what was happening within the walls. Even making allowance for these, the death rate can hardly have been high. Perhaps this explains why the later epidemics struck Florence so severely. In the Netherlands the plague apparently reached its limit from two directions.[61]

It should be recognized also that the Black Death had an age specific pattern which has usually escaped attention. Thus, the heavy mortality of the clergy and high officials is, in reality, the normal mortality of men of forty years and above.[62] The age specific pattern of the disease is of the most common type except that apparently it did not have a high mortality among very young children. Thus, it had a low mortality for the young and arose with age until it was very high among those fifty and above.[63]

An interesting study of Albi, France, shows that migration, apparently from fear of the plague, was often a factor in urban decline during the plague.[64] Albi seems to have declined from about ten thousand inhabitants in 1343 to less than five thousand in 1357. Now the author shows, since she has the names of the inhabitants, that of 638 persons in one division of the city (Vigan) only 142 were present fourteen years later, instead of the expected 325.[65] Of these 74 were in the same quarter while 68 had moved to other quarters of the city. Moreover 118 of the inhabitants of Vigan had not been in the lists of 1343 in any part of the city. Now, of course, some of the new people had probably inherited property but a considerable number must have migrated into the city. There more sparsely settled areas of the city showed much less loss of population than the more thickly settled divisions.

TABLE 44

PLAGUE MORTALITY, ST FLOUR, FOURTEENTH CENTURY

Years	Hearths	Per cent of pre-plague number
1299, 1314, 1338	1,304	100.3
1338–46	1,300	100
1348	864	66.5
1356	769	59.1
1362	741	57.0

Source: Boudet, M., et R. Grand, Etude historique sur les épidémies de peste en Haute-Auvergne, *Revue de la Haute-Auvergne*, 37–38, 1902.

With the Albi data may be compared information about the little city of St. Flour in Haute-Auvergne (table 44). The plague of 1362 is alleged to have killed the rich and the babies but left the women little affected.[66] The number in the suburbs of St. Flour decreased from 314 to 99 in 1362 as many moved into the city.[67] Probably the plague struck in the suburbs first and drove the people into the city in panic. Otherwise the decline is about normal for the plague.

Another illustration of mortality comes from the little parish of Givry in Burgundy.[68] The three years immediately before 1348 have an average death rate of 35 persons but for the nine years of apparently complete records of pre-plague experience it was 27.[69] At an average death rate of 3 per cent a year the population was perhaps about 1,170 although it may have been less. The deaths of the first years (649) thus would be about 50 per cent, a very high rate. Yet in 1360, just following the plague of 1359, there are 310 hearths recorded,[70] which at 3.5 gives 1,085 persons to the parish. Migration probably replaced the loss in large part. Marriages which had averaged 18 yearly from 1336 to 1341 (the years of complete records of marriage) jumped to 86 in 1349 and 33 in 1350.[71] The birth rate should also have arisen. Evidently the very high rate in Givry was local. Otherwise, so many persons from the outside would not have flocked to the city following the plague. It is an interesting study in readjustment of population following the plague.

A figure has been presented for the loss by plague in the Franciscan order which, if valuable, would be

[61] Van Werveke in IX Hist. Congress, **2**: 40.

[62] See such instances mentioned by Y. Renouard, Conséquences et intérêt démographiques de la peste noire de 1348, *Population* **3**: 459–466 esp. 463, 1948.

[63] Russell, *BMP*, 214–229.

[64] Prat, G., Albi et la peste noire, *Annales du Midi* **64**: 15–25, 1952.

[65] This assumes that Albi should have experienced the same mortality as the 1301–1325 generation did in England. See the life table for that generation, Russell, *BMP*, 182. In table 8.5 the number of persons twenty years and over is 15,140 (column T_x). The number of those thirty-five and over is 7,245. However, since the years from 1343 to 1357 number only fourteen instead of fifteen covered by these numbers, one year's difference, 455 is added which raises the 7,245 to 7,700. Of 15,140, the number 7,700 is about 51 per cent, which is the per cent assumed to have survived in Albi since the names in the lists were mostly of adults.

[66] Boudet et Grand, 39. (See table 44.)

[67] *Ibid.*

[68] MS Givry, *C C 74* studied by P. Gras. Le registre paroissial de Givry (1334–1357) et le peste noire en Bourgogne, *Bibl. Ec. Chartes* **100**: 295–308, 1939.

[69] 1336–1341, 1345–1347.

[70] *Ibid.*, 307.

[71] Marriages 1351–1357 averaged fifteen to the year, which suggests a slight reduction in population over the preplague period (p. 303).

TABLE 45

HEARTH TAX RETURNS, RODEZ, 1328–1666

Date	Total hearths	*Bourg*	*Cité*	
			Inside walls	Outside
1328	2,300			
1350	966		[781]	185
1352	1,029		[804]	225
1353	1,035		[805]	230
1354	1,002		[773]	229
1355			440	223
1397			396	81
1450		540		
1497		556		
1666	944	388	392	71 (+93 forain)

Sources: Molinier, A., La sénéchausée de Rouerge en 1431, *Bibl. Ec. Chartes* **44**: 463, 1883; Lot, *Recherches* **2**: 144–146.

significant in view of the wide reach of the order. The figure is offered by a sixteenth-century writer, Spangenburg, who said that he had it from an old list (verzaichnis)[72] and is 124,434. Since this is much larger than the total for the whole order, an author corrects by removing the first cipher. This assumes, of course, that someone took the trouble to collect the number of deaths for the years 1348–1350, which is somewhat unlikely. Against the revised number is to be placed an estimate for the total membership of the order with its approximately 1,450 houses. Here an old statement tells that the Strasbourg province of the order with a few more than 50 houses lost 800 of its 1,200 members. Thus each house would average little less than 25. At 23 to the house, the 1,450 houses should have had about 33,350 members and the loss for the total order would be, like that alleged loss of the Strasbourg province, about two-thirds. Given the age distribution of the order, two-thirds loss is almost too high for belief even though the Franciscans tended to live in the poorer quarters of the cities, exposed more directly to the plague. However nearly every factor in the construction is subject to doubt. The English religious houses showed a wide variation of mortality but it averaged nowhere near two-thirds.[73]

Another interesting case is that of Rodez which was divided in two parts, the *bourg* and the *cité*. The schedule of data (table 45) poses some problems. The figures in brackets are said to be from the *cité* alone: this fails to explain why the total for the part inside the city should decline by 333 in one year while the number outside remained the same. It seems more likely that the number is that of the entire city (*bourg* and *cité*). There was evidently a return of some who had fled in 1348–1350 but after 1355 another decline set in. The figures for the *bourg* would indicate that another increase occurred there in the fifteenth century, later lost.

The plague obviously played havoc with the population of Provence. In the one case where the plague results can be traced at least a few times during its course, at Forcalquier, data remain for the years 1350, 1354, and 1374. Here (see table 46) the city recovered markedly from 1350 to 1354 and held its own during the next twenty years in spite of two more severe epidemics and a constant endemic condition of plague. It is so doubtful that in four years the city recovered from 281 to 304 hearths that migration into the city should probably be assumed.

The two plagues had a general pattern in common: an initial and very lethal attack and subsequent epidemics at irregular intervals for about a half-century. Under the circumstances it would seem that about the same mortality could be expected for the two. From

[72] Bigelmair, A., Zur Statistik der grosser Pestepidemie des 14. Jahrhunderts: die Zahl der Opfer im Franciskanerorden, *Archiv für Hygiene* **130**: 196–204, 1943.

[73] Russell, *BMP*, 221–225.

TABLE 46

HEARTH TAX RETURNS FROM SITES IN PROVENCE, 1311–1451

Name of city	Pre-plague data			Data after 1348–1349		
	Hearths	Date	Document	Hearths	Date	Document
Aix	1,486	1346	B 1593	719	1356	P.101
Beauvezer	89	1344	B 1815	42	1451	B 1816
Colmars	327	1344	B 1815	209	1451	B 1816
Coursegoules	40	1345–1346	B 1907	12	1352	B 1909
Forcalquier	581	1311	B 1885	281	1350	B 1892
				304	1354	B 1894
				303	1374	B 1897
Moustiers-Sainte-Marie	619	1344	B 1483	204	1354	B 1985
Roquestéron	110	1345–1346	B 1907	49	1352	B 1909
Sigale	144	1345–1346	B 1907	75	1352	B 1909
Total	3,396			2,198		

Sources: the documents are in the archives of the department of Bouches-de-Rhone at Marseilles. The item about Aix is from the *Inventaire-Sommaire* of the archives.

TABLE 47

POPULATION DECLINE DURING THE PLAGUE, 1348–1377

Place	Date to date	Population	Decline to per cent	Source Table no.
England	1346 1377		60	
France				
Aix	1340 1356–1357	1,377 955	69	132
Albi	1343 1357	10,000 5,000	50	
Provence (partial)	Before After	3,396 2,198	65	46
St. Flour	1346 1348	1,300 864	66	44
Norway	Before After		73.7	58
Sweden	1348 1351		58	57
Catalonia, salt	1346–1347 1362–1363		65	118
Normandy	1328 1385–1395		59	131

Sources: from the tables listed except for England: Russell, *BMP*, 214–232.

the second round, for which the evidence is better, it would seem that a drop of about 40 per cent in population occurred in the first two decades of the plague. An exception should probably be made for the drier lands. For North Africa, Egypt, and Syria it is assumed that a lower mortality rate occurred. Assuming that the desert would have a very low mortality, the mortality rate for these countries is set at 10 per cent instead of 40.

5. OTHER DISEASES

The history of other epidemics in the Middle Ages needs clarification. There is, for instance, an interesting study of a pestilence recorded in the Irish Annals.[74] The writer identified not merely the sixth-century pestilence as the plague but also the epidemics appearing in 664, 682, and 1085. Of other epidemics he suggests that the other sixth-century plague, a "yellow fever," was the relapsing fever. Others he would identify as the smallpox, "button scurvy," and poliomyelitus.[75] All of this suggests that the history of diseases is a rather complicated subject that will require much study before even their courses are known. It suggests also that the virus, germs, and bacteria may have their own history with perhaps long periods of quiescence or benign existence. There is, furthermore, the problem of the effect of new diseases whose immediate effects might be more drastic than at a later stage after the population had been partially immunized by previous contact.[76]

The problem of disease centers about the ability of the disease to restrain or to reduce population. Only one disease, the plague, seems to have been lethal enough to destroy population faster than humanity could restore it in the late ancient and medieval periods. Even in the case of this disease it was probably the attitude of the people who displayed a certain indifference to depopulation rather than sheer inability alone which caused such drastic reductions in population. Tuberculosis was a heavy burden to carry, probably sufficient in itself, given the medieval dislike of prolificy to cause a slow decline of the population of the urbanized empire. The influence of malaria is more difficult to estimate: it undoubtedly had a deleterious effect, particularly the malignant type. If the climate did become warmer to A.D. 550 its evil effects must have operated further and further north. Yet its age specific mortality pattern shows that it largely reduces the aged and weak, thus hastening the inevitable. The combination of these diseases and conditions produced a high mortality, particularly for women in the years from fifteen to thirty-five.

How decisive were climate and disease then? As we shall see in the chapter on theories of population, the people of the later Roman and early Middle Ages had a surprisingly consistent attitude toward population. Given this consistency, climate and disease probably did determine the downward course of population: a gradual decline of urbanized tuberculosis and rural malaria: sudden decline of plague and recovery as the children of those resistant to those diseases populated the territories again, until the second great plague started population tobogganing again. Yet at all times a changed attitude would probably have caused population to rise even during the unfavorable conditions in the later Roman Empire, or in the later fifteenth century.

V. AGE AND HABITATION GROUPS

The ideal data for population are approximated by matter prepared for census purposes, carefully broken down into numbers for age, sex, and other classifications. Some medieval data offer at least a partial approach to this ideal. For the most part, however, the information was secured for purpose of taxation. Fortunately, taxation had as its units of assessment a house or a head and thus it offers accidentally considerable demographic information. It is the purpose of this chapter to present methods of critical treatment of such evidence and to discuss the number to be assigned to such units by which they may be multiplied to secure an estimate of total population.

[74] MacArthur, W. P., The identification of some pestilences recorded in Irish annals, *Irish Hist. Studies* **6**: 169–188, 1949.

[75] *Ibid.*, 174, 183–184 and 185–186 respectively, but J. D. F. Shrewsbury would identify the yellow fever with small pox. *Jour. Hist. Medicine* **1**: 5–47, 1949.

[76] See, for instance, the interesting article suggesting that it was the measles which decimated the Athenians in their war with Sparta. Shrewsbury, J. F. D., The plague of Athens, *Bull. Hist. Medicine* **24**: 1–25, 1950. This is doubted. Keil, H., The louse in Greek antiquity, *ibid.* **25**: 305–323, 1951.

1. STATISTICAL INTEREST

The point of view of this study is that man is so highly gregarious that his relationships are integrated and intricate. Therefore, the parts of such a human development as population must conform to patterns which are possible to determine by means of statistical methods. It is thus likely that peoples of similar conditions, social, political, and economical, will have much the same demographic pattern unless there are serious disturbances or disasters of health or environment. Statistical approach implies a lack of significance of individual instances and the importance of the mass of numbers.

Statistical interest coincides to a considerable extent with our interest in this world. This should mean that the centuries in which such an interest was low and subordinate to interest in a future world beyond the grave would not yield as many accurate data as other periods. This is largely true. The later Roman Empire produced a considerable body of accurate data about population of which the great mass has been lost. Beginning about the thirteenth century an awakening interest in this world appeared which is also evident in the data about population derived from various taxes of the time. The effort to define demographic development in the central period of the Middle Ages must rest to a high degree upon integration of the meager body of information of that period with the greater amount of information available from the later Roman Empire and from the end of the medieval period, and the beginning of the modern Europe. It means that in regard to gross numbers the surveys which, in a number of instances, give a total estimate for regions and countries can be supplemented by more casual information about parts of the areas. In this way some effort can be made to detect trends of population change.

The value of demographic data varies with a number of factors. A direct statement of total population, if accurate, is obviously the most valuable information about this phase of population—this type will be considered first. Information of less than total population varies with the percentage of population covered since the inclusion of a larger part of the population lessens the chance that the sample is badly biased. This holds true where capitation is taken—if of adults it often numbers nearly two-thirds of the population. Then the indications of the number to the house or family appear. Since the least number to be assigned to these is 3.5 it represents less than 30 per cent of the total—any increase in the index figure reduces the percentage value of the sample. Beyond these types of evidence the problems are often great. What, for instance, is the relation between areas within city walls and the total population? Similarly, there are difficulties in assessing the percentage of total population of an area which should appear in metropolitan and provincial capitals.

The collection of information about great numbers of persons was usually either for purposes of census or for taxation. When all are not included there are problems of two types. The first concerns the exempted portions of the population. Sometimes the exemption is made on the basis of economic or other status: it is often difficult to estimate what proportion is exempted. If the exemption is based upon age groups, it is easier to make a reasonable estimate of the number who were exempted by the use of life tables. Sometimes geographical areas are not clear and thus another factor of complication appears in the use of the data. Thus all bodies of data must be subjected to as careful an analysis as possible to determine the percentage of exemption.

2. TOTAL POPULATION

The chief problem associated with a direct statement of total population of a place is the accuracy of the information. Josephus, for instance, estimated a population for Egypt of 7½ million. It is a high estimate and probably Josephus could have had some access to information about the Egyptian poll tax. But was it so assembled and selected? A wide variety of estimates for the invading German tribes appears but most of them are obviously exaggerated.[1] There are many, many guesses about population, often very large. There seems no general principle which may be applied except that, in most cases, they have little resemblance to actual numbers.[2] They reduce to no rule, each case requiring special consideration. A good example is that of the estimates provided by Venetian envoys.

The Venetian ambassadors sent reports to be read to the Venetian Senate. As valuable as they are from many points of view, they greatly overestimate population. In table 48 it can be seen that they indicate a correct figure for Lucca as is known from a report of the place. One figure for London was approximately correct, but the other shows about the usual inaccuracy, in many cases as much as quadrupling the actual sizes. The only serious underestimate is the case of England where about a third of the real population is given. Now these men were skilled observers in the service of a careful city. If they were so inaccurate, it can be imagined how much trust may be placed in casual observations in regard to size.

The best total figures are those presented by the Polyptyque d'Irminon of the ninth century[3] and by the data for the city of Madrid and the diocese of Seville of the sixteenth century.[4] Not only is total population given but the data are broken down for important divisions of society. The former gives the names and marital status of the persons and so provides interesting

[1] Bury 1: 104–105.

[2] A very good statement of the difficulty of believing medieval numbers appears in Lamprecht, K., *Deutsche Wirtschaftsleben im Mittelalter* 2: 9–16, 1885.

[3] See table 5.

[4] See below, table 55.

TABLE 48

ESTIMATES OF POPULATION BY VENETIAN ENVOYS

City	Venetian estimates			Basis of comparison		
	Date	Number of hearths	Population	Date	Number of hearths	Population
1. Amsterdam	1506	6–7,000	24–28,000	1470	1,869	7,476
2. Antwerp	1506	20–25,000	80–100,000	1496	6,586	27,344
3. Arras	1506	6–7,000	24–28,000			
4. Bois-le-Duc	1506	8,000	32,000	1496	3,456	13,424
5. Bruges	1506	25,000	100,000	1340	6,250	25,000
6. Brussels	1506	12,000	48,000	1496	5,448	21,792
7. Ghent	1506	20,000	80,000	1359	10,780	24,744
8. Louvain	1506	10,000	40,000	1496	3,069	12,276
9. Malines	1506	8,000				
10. England	1506	230,000	920,000	1545		3,220,000
11. Paris	1492	300,000				
12. Paris	1535	size of Venice				130,000 Venice
13. Paris	1546	500,000				
14. Paris	1558	400,000				
15. London	1531	70,000		1545		80,000
16. London	1554		180,000	1545		80,000
17. Genoa	Ca. 1550		130,000	1657		50,000
18. Lucca	Ca. 1550		24,000	1645		25,000
19. Milan	Ca. 1550		250,000			68,490
20. Constantinople	1571		300,000			

Sources: Venetian; *Relazioni*, ser. 1, **1**: 10, 11 for 1–9; **1**: 19 for 10; **4**: 17 for 11; **1**: 148 for 12; **1**: 225–226 for 13; **2**: 403 for 14; **3**: 19 for 15; **3**: 51 for 16; ser. 2, **2**: 446 for 17; **2**: 457 for 18; **2**: 480 for 19; ser. 3, **1**: 389 for 20. Late medieval; IX Hist. Congress, 80 for 1, 2, 4, 5, (6, 250), 6, 7, 8; Russell, *BMP*, 235 for 10; 11–13, see p. 119; Russell, *BMP*, 298 for 15–16; see p. 126 for 18–19; p. 120 for 20.

figures for these phases of medieval population. The Spanish evidence is broken down by *vecinos* (families) and houses and so provides reliable data to develop index figures for these divisions. While the index figures derived from these sources may not hold for all of medieval Europe, they do offer some very reliable data and their concurrence in certain respects causes them to appear to be generally valuable. At least they create a presumption in favor of certain index figures which should cause those who differ to offer as equally reliable evidence.

There are data about total population for several cities of central Europe: Nürnberg, Nordlingen, and Strasbourg.[5]

Nürnberg, 1449 20,155
Nordlingen, 1459 5,295
Strasbourg, 1473–1477 26,198–26,088 (city alone 20,612–20,722)

These cities are from the parts of Europe which would be affected somewhat by the increasingly severe weather of the fifteenth century. Fortunately, evidence appears from these and other cities which makes it possible to check estimates about hearths and houses for the period. There is also good evidence in regard to Ypres for several years in the century and for Fribourg in Switzerland.[6] It should be evident that estimates based upon nearly total population must be corrected only for missing groups, such as the clergy occasionally, and will be accurate within a per cent or two.

3. AGE GROUPS: CENSUS AND POLL TAX

In between the evidence for all of the inhabitants of an area and the very common evidence for numbers of houses or hearths, there are data for large sections of

TABLE 49

YPRES: POPULATION ESTIMATES, 1412–1506

Quarter	1412	1431	1437	1491	1506
Poorterie			2,062		2,078
Draperie	2,105		1,880		
Vulres	3,208				2,973
Ghemeene Neringhe	2,949	2,890	2,775	2,066	
Estimated Total	10,736	10,523	9,390	7,626	9,563

Source: Pirenne, H., Les dénombrements de la population d'Ypres au XVe siècle (1412–1506). *Vjschr. f. Sozial- u. Wirtschaftsgesch.* **1**: 1–32, 1903, esp. pp. 10–11.

[5] Nürnberg: Hegel, C., *Chroniken der deutschen Städte* **2**: 500–523, 1864; Bücher, K., *Die Bevölkerung von Frankfort am Main im 14. und 15. Jahrhundert*, 31 f., Tübingen, 1886; Jastrow, J., *Die Volkszahl deutschen Städte zu ende des Mittelalters*, Berlin, 1886; Nordlingen: Dorner, F., Die Steuern Nordlingens zum Ausgang des Mittelalters, Munich, 1905; Strasbourg: Eheberg, K. T., Strassburgs Bevölkerungszahl seit Ende des 15. Jahrhunderts bis zur Gegenwart, *Jbb. f. Nationalök. u. Statist.* **41**: 297–314, 1883; **42**: 413–430, 1884.

[6] Pirenne, H., Les dénombrements de la population d'Ypres au XVe siècle, *Vjschr. f. Sozial- u. Wirtschaftsgesch.* **1**: 1–32, 1903; Buömberger, F., *Bevölkerungs- und Vermögensstatistik in der Stadt und Landschaft Freiburg im Üchtland um die Mitte des 16. Jahrhunderts, Freiburger Geschichtsblätter* **6–7**, 1900 or *Zeitschrift für Schweizer Statistik* **36**: 1900.

the population based upon age groups. These data usually derive from taxes laid upon adults. If they include the widest group they make all persons over age fourteen or fifteen liable, assuming no exempt groups, and thus include about two-thirds of the population. The most accurate index can be estimated from life tables most closely related to the time and place. If all persons above twenty are included, the sample is about one-half, while taxes upon males alone include from a third to a fourth.

The Roman census was originally a census of adults (over seventeen), primarily for military registration. The number increased abruptly from about 900,000 in 69 B.C. to 4,063,000 in 28 B.C. This has raised a serious question among scholars. Was the increase merely an extension of citizenship to many men or to women as well? The view that it included only men is urged with an effort to show where the large additions entered citizenship.[7] Furthermore, Dionysius, writing of Rome of 472 B.C., is thought to give the practice in the contemporary census of Augustus.[8] Since Dionysius was a historian, he cannot be assumed arbitrarily to have used contemporary practice in place of the earlier and different practice. In fact, one might suggest that, if the practice of his day was the practice of the earlier period, there was no real point in describing the earlier practice. The estimate of Italian population based upon the hypothesis of continuing practice is about 18,000,000 which would seem, upon the basis of other evidence, about twice too high.[9] Only the indication that a very high proportion of Roman citizens lived outside of Italy apparently can save this hypothesis.

The words used in describing the census were "civium capita" [10] which can refer to women as well as men.[11] Since Pliny refers to the number of men and women in parts of Italy over the age of one hundred recorded in a census of the first century B.C., the possibility of including both in B.C. 28 seems large.[12] The municipalities were enrolling the names of all *cives* soon after this in accordance with the provisions of the Lex Julia Municipalis.[13] In many places the local censuses certainly did include others beside adult males during the time of the Empire.[14]

One point in regard to the tax returns seems reasonably clear—that taxation districts included a fairly large city and its environs to a considerable area. Thus the returns should include a city state area rather than the city alone. This is clear because inscriptions and other evidence refer only to large places. If the tax districts were small in any large area, at least some small returns should have survived to this day. To some extent this then explains the large size of the populations assigned to the cities. The problem then arises as to the area assigned to the city and what proportion of the total belongs to the city area rather than to the whole area.

The problem of the census taken over the Roman Empire in the time of Augustus and later emperors is quite complicated.[15] It would seem that it was not a general census based upon the same principles everywhere. Ulpian, in speaking of the census, remarked that the age had to be given because some were exempt because of age. Then he illustrates from the case of Syria where men were subject to tax from fourteen to sixty-five and women from twelve to sixty-five.[16] There would seem to be at least one case where even children were included.[17] However, in general it would appear that adult men and women were included in the registers of the census and were reregistered at intervals of five, ten, or fifteen years. Thus, when Pliny wrote of *capita libera* in the first century A.D.,[18] he was probably including adult men and women or at least those above fourteen years of age. This should include about two-thirds of the population. However, slaves were to be included and, in some places, aliens. The *capita libera* then should probably be multiplied by one and one-half up to two to get an approximation of the total population.

Some light upon the problem is thrown by an inscription coming from the district of Apameia in Syria. It is the report of Quintus Aemilius Secundus upon his *census* of the people (*civium hominum*) of Apameia in A.D. 6/7 [19] whom he said numbered 117,000. These, as has been pointed out, included all men, women, and children in the category mentioned.[20] It is impossible to believe that there were this many Roman citizens in

[7] Frank, T., Roman census statistics from 225 to 28 B.C., *Classical Philology* **19**: 337–341, 1924. Concurred in by A. H. M. Jones, Ancient economic history, an inaugural lecture delivered at University College, London, 1948, 3–10.

[8] Dionysius of Helicarnassus, IX, 25, 36.

[9] P. 72.

[10] 28 B.C. "Quo lustro civium Romanorum censa sunt capita 4,063,000." 8 B.C. "Quo lustro censa sunt civium Romanorum capita 4,233,000." A.D. 14. "Quo lustro censa sunt civium Romanorum capita 4,937,000." Augustus, *Res Gesta*, VIII, 4, 10, 15. Hardy, E. G., *The Monumentum Ancyranum*, 53, Oxford, 1923. A.D. 48. "Condiditque lustrum quo censa sunt civium quinquagies novies octoginta quatuor milia septuaginta duo." Tacitus, *Ann.* 25.

[11] Lewis and Short, under "civis."

[12] Beloch, J., Die Bevölkerung Italiens im Altertum, *Klio* **3**: 471–490, esp. 481, 1903. He quotes Pliny, VII, 162 ff.

[13] Municipal censors shall record "eorum nomina, praenomina, patres aut patronos, tribus, cognomina et quot annos quisque eorum habet et rationem pecuniae ex formula census quae Romae proposita erit." Frank, as above, 338.

[14] See, for instance, Schulz, F., Roman registers of births and birth certificates, *JRS* **32**: 78–91, 1942; **33**: 55–64, 1943.

[15] Daremberg-Saglio, *Dictionnaire des antiquités grecques et romaines*, under "census," Paris, 1918 and Frank, *ESAR* **2**: 492, 493, 531–537; **3**: 145, 481, 493, 527, 603, 619; **4**: 82, 454, 455, 567; **5**: 2.

[16] Ulpian in Digest L. 14, 4.

[17] Frank, *ESAR* **4**: 455 citing *I.G.* XII, 5, 946.

[18] Pliny, *Nat. Hist.* III, 28.

[19] "Iussu Quirini censum egi Apamenae civitatis millium hominum civium cxvii." *ESAR* **4**: 158 for translation.

[20] Cumont, F., The population of Syria, *JRS* **24**: 187–190, 1934.

TABLE 50

THE VALUE OF THE IUGUM AND CAPUT

Place	*Iugum*		*Caput*	Déléage page
	Description	Hectares		
Syria	Vineyard 5 *iugera*	1.3	Man, 14–65; woman 12–65	148
	225 mature olive trees	11.5		
	450 young olive trees	23		
	Best grainland, 20 *iugera*	5		
	Medium grainland, 40 *iugera*	10	(Average about 7.45)	158
	Poor grainland, 60 *iugera*	15		
Egypt	72 aruras	18	Adult man	115
Asia Minor	1,500 olive trees	70?	1 man, 2 women	187
	Grainland	18–19	2 = 2 or 3 men, 4 women	182, 198
Italy	*Millena*	3		223
	Iugum	25	*Capitatio plebeia*, man-woman 14–12 up.	231
Gaul	*Caput*	15?		213, 231
Britain	Iugum = ½ hide	20		
N. Africa	Century or 200 *arpents iugera*	50	1 man, 1 woman	231

Sources: Britain. Assuming eleventh-century *iugum* same as the Roman. P. Vinogradoff, Sulung and hide, *English Hist. Rev.* 19: 284, 1904. Gaul: See below, p. 50.

The area assigned to olive trees assumes that they are planted about 75 feet apart (*Encyclopaedia Britannica* under "olive" for North Africa): on irrigated land about 40 feet apart. Cato said that a 240 *iugera* (60 hectares) olive plantation should have 13 workers, all men except the wife of the overseer (Frank, *ESA* 1: 162). For vineyards he would have 16 workers, including again the overseer's wife, to handle 100 *iugera* (25 hectares), or about 6 *iugera* to the person. (Frank, *ESAR* 1: 163). Cicero (*De lege agraria* 2: 29–31) says 10 *iugera* to the man in the Campania or 12 *in agro stellate*. This was rich land. The information about Syria is in K. G. Bruns and E. Sachau, ed. *Syrische-römisches Rechtsbuch*, art. 121, 286–289, Leipzig, 1880.

Apameia and its district then, when the total number of such citizens was less than 6 million of which four-fifths are supposed to have been in Italy. It is even impossible to believe that the area could have had a third of the number. Since the purpose was obviously for imperial purposes rather than for local, one would expect that all of the freemen would have been enrolled: probably all those that paid the poll tax. The problem is whether the slaves would have been noted. The area includes more than the city itself since the latter measured only about 250 hectares [21] and therefore probably included no more than 38,000 persons.

As we have seen, the Romans had a poll tax with registers to record the number of taxables. Diocletian devised a new method of taxation by the *iugum* and the *caput*, the unit of tilled land and the worker.[22] It included both men and women,[23] but not the feeble, the young, the imbeciles, or the elderly.[24] The relationship of land to people and the stability often attained is discussed elsewhere: it is sufficient to say that marriage and other customs probably did produce a close relationship between the two.[25] Furthermore, all lands were covered, not only of the ordinary free workers and villages but also the lands of the emperor, the senators and the Church.[26] Data thus secured about a territory should cover all but the landless persons within the cities.

A recent and detailed study of *iugum* and *caput* shows that they varied considerably from area to area (table 50) but were always units for assessment.[27] They can naturally not be multiplied by the same index to get total population. In Syria it is obvious that multiplication by two would be near the actual number with perhaps some addition for townsmen not connected with farming. The same is probably true of Italy, Gaul, and England. In Egypt, Asia Minor, and North Africa the multiplier should certainly be higher although the question actually does not arise.

The information for the collection of these Roman head and land taxes was incorporated in polyptyques or registers.[28] The practice of using such registers continued into the ninth century when they were used by monasteries in recording their property. The Abbey of St. Victor of Marseilles had even the ages of many of the children recorded in their polyptyque.[29] The

[21] *Ibid.*, 189.

[22] Déléage, La capitation dû Bas-Empire, Macon, Impr. Potat Frères, 1945; Piganiol, A, *L'impôt de capitation sous le Bas-Empire romain*, Chambéry, 1916.

[23] Piganiol, *op. cit.*, 13, 20.

[24] *Ibid.*, 13, 20, 36.

[25] See p. 133.

[26] Piganiol. *op. cit.*, 38 ff.

[27] Déléage, *op. cit.*

[28] Studied by C. H. Taylor in his Harvard thesis, 1927. For a fragment of a seventh century polyptyque see Troya, *C., Codice diplomatico Langobardo dal 568 al 774* 2: 494–495, Naples, 1852–1854.

[29] Edited by B. Guérard, *Cartulaire de l'Abbaye de Saint Victor de Marseille*, Paris, 1857.

Abbey of St. Remi of Reims occasionally records ages of its children.[30] These preserve valuable information for age and sex composition of the population. Besides these there were many of the records, particularly of the centres in Gaul and Germany. These records show a head tax (*4d, 8d, 12d*) of the personal type which reappears as typical of even later head taxes.

The *iugum* may have continued in northern Europe in some connection with the later local unit there, the manse (*mansus*). The manse in Switzerland was probably about 60 *iugera* (15 hectares) in size,[31] about the same size as the largest *iugum* of Syria. The *mansus* was probably the land of one family and thus should have consisted of two *iuga*. One, indeed, is struck by the number of *mansus* in Gaul held by two people—it would seem that they fell easily into two divisions.[32] To be compared with this is also the problem of the hide, also the land of one family.[33] It is apparently, with its 120 acres, about 180 *iugera* or three *mansus* in size. There were in southern England small hides of about 40 acres—about the size of the *mansus*.[34] The ideal time for the consolidating of the *capita* into *mansus* would have been during the first period of the Black Death (542–600) when the population may well have been halved.

Even the Moslems had a poll tax which was taken over from the Persians: it was levied only upon Christians and other non-Mohammedans and upon men alone. In their territories the Persian Sassanids had made the males from twenty to fifty years of age pay although certain classes were exempt: administrative chiefs, soldiers, priests, secretaries, royal officers, and sometimes the very poor. Usually the tax was graduated, but most of the people paid the smallest amount.[35] The one large exempt class, except the poor, would be the soldiers, but armies were seldom large and included few Christians or Jews. In the early centuries the loss of the exempt was largely offset by the higher fees of the wealthier so that the average was not far from a total average. Of course with the conversion of persons to Mohammedanism, fewer would pay the poll tax. The percentage of persons in the population of men above twenty, since apparently the Mohammedan rulers included those above fifty also, would be about one-quarter of the population.[36] If the very poor were exempt, probably the number should be multiplied by at least six.

In England there were two forms of head tax which appeared shortly after the Conquest and which preceded the famous poll tax of 1377. The first was the frankpledge tax, so much to each man of the frankpledges.[37] Frequently, the tax became a lump sum and thus ceased to be a personal tax. The other was the small sum paid by men and women to maintain their rights on the manors while they were living outside of their parents' houses.[38] The second was, like the *capitatio* of the Roman days, paid by the able-bodied workers, men and women alike. It was unlike the *capitatio* in that it was laid upon workers with no agricultural holdings. Even the poll tax of 1377 was preceded by an adult tax in Brabant of 1374. The latter, however, was relatively high and did not apply to large groups who were to be included in the English tax of a few years later.[39]

The most promising of the data on a wide scale is that of the English poll tax of 1377. It has been analysed elsewhere in some detail.[40] The method of collection by well-tried officials followed a pattern in which the English had been notably successful. The theory that all should pay a relatively small sum was reasonable in the circumstances of 1377. The collection was made house by house and apparently checked upon carefully. Even the vagrants who were not manifest mendicants were held and forced to pay. Here probably occurred some of the rounding noticed in the analysis of the returns—their contributions could not be checked as carefully as the payments of those lodged permanently in the villages and cities. Nevertheless, the accuracy of the returns has been questioned and the suggestion that the five per cent allowance for failures was not sufficient has been made.[41]

As has been said, the ideal of the poll tax of 1377 was a small tax paid by all above the age of thirteen. The next tax, often called a poll tax, of 1379 was largely based upon earnings and is more properly termed an income tax. In 1380–1381 a hybrid theory was to be followed. On the average all were to pay one shilling—thus it was to be a poll tax. However, the rich were to pay more and thus assist the poor. Apparently then discretion was left to the collectors to work out an equitable arrangement. They certainly used their discretion for nowhere near the correct amount was collected. It has been pointed out that the

[30] Guérard, B., *Polyptyque de l'Abbaye de Saint-Remi de Reims*, Paris, 1853.

[31] Dorring, F., Études sur le cadastre médiéval en Suisse, *Ztschr. f. Schweiz. Gesch.* **30**: 198–243, esp. 211, 1950.

[32] One might notice whether medieval holdings appear to have been divided into two parts.

[33] Maitland, F. W., *Domesday Book and beyond*, 446 ff., Cambridge, 1907.

[34] In southern England the *iugum* was about 20 hectares (50 acres) and was half of a hide which was the same as the *manentis* (*mansus*) and half of the *sulung*. Vinogradoff, P., Sulung and hide, *Eng. Hist. Rev.* **19**: 284, 1904. On hides: Tait, J., Large hides and small hides, *ibid.* **17**: 280–282, 1902.

[35] Dennett, D. C., *Conversion and the poll tax in early Islam*, 15, 28, 107–115, Cambridge, Mass., Harvard Univ. Press, 1950. This is the natural conclusion from the chronicler's statement that all Persian families paid the smallest amount (pp. 15–16).

[36] See table 19 for instance.

[37] Morris, W. E., *The frankpledge system*, 130, Cambridge, Mass., 1910.

[38] Russell, *BMP*, 67.

[39] Cuvelier (see p. 12, n. 71), lxxxii-xcix.

[40] Russell, *BMP*, ch. VI.

[41] Notably by Stengers in *R. Belge de Philol. et d'Hist.* **28**: 600–606, 1950.

TABLE 51

RELATION OF POLL TAX OF 1381 TO THAT OF 1377 IN ENGLAND

County or subdivision	Order	Per cent of 1377	Persons in 1377	Persons in 1381
Rutland	1	93.3	5,994	5,593
Cambridgeshire	2	88.9	27,350	24,324
Middlesex	3	88.4	11,243	9,937
London	4	87.5	23,314	20,397
Worcestershire	5	82.8	14,542	12,043
Herefs.	6	82.6	15,318	12,659
Oxon	7	82.4	24,982	20,588
Warwicks	8	80.5	25,448	20,481
Hunts	9	79.7	14,169	11,299
Kent	10	77.5	56,557	43,838
Suffolk	11	76.2	58,610	44,635
Gloucestersh.	12	75.8	36,760	27,857
Sussex	13	75.3	35,326	26,616
Norfolk	14	75.1	88,797	66,719
Staffordsh.	15	74.5	21,465	15,993
Linc-Holland	16	74.2	18,592	13,795
Bedfordsh.	17	73.2	20,339	14,895
Linc-Kesteven	18	72.957	21,566	15,734
Bucks	19	72.945	24,672	17,997
Wiltshire	20	71.9	42,599	30,627
Surrey	21	70.3	18,039	12,684
Northants	22	69.6	40,225	27,997
Berkshire	23	69.075	22,723	15,696
Leicestersh.	24	69.063	31,730	21,914
Derbyshire	25	67.3	23,243	15,637
Hertfordsh.	26	66.6	19,975	13,296
Nottinghamsh.	27	66.4	26,260	17,442
Southants.	28	66.2	33,241	22,018
York-E.R.	29	65.9	38,238	25,184
Essex	30	64.1	47,962	30,748
Linc-Lindsey	31	64.0	47,303	30,235
Dorset	32	58.7	33,251	19,507
Somerset	33	55.6	54,603	30,384
Shropshire	34	55.3	23,574	13,041
Westmorland	35	52.2	7,389	3,859
York-W.R.	36	47.8	48,149	23,029
York-N.R.	37	47.3	33,185	15,690
Devon	38	45.3	45,635	20,656
Cumberland	39	40.1	11,841	4,748
Cornwall	40	35.2	34,274	12,056
Lancashire	41	35.1	23,880	8.371
Total		66.1	1,355,555	896,481

Sources: 1377, Russell, *BMP*, 132–133; 1381, Oman C., *The great revolt of 1381*, 163–165, Oxford, 1906.

payments were made in some places by the men householders and their wives if they had any, and that other women were not counted. There was a great superiority of number of men taxpayers in 1380–1381.[42] However a little different interpretation of what happened is possible.

In table 51 the averages of payments are given by counties and subdivisions. The officials doubtless found before long, as Oman noticed, that rich men were scarce and unevenly distributed, so that there were discrepancies in what even the poor had to pay. This, of course, made for serious problems. It would appear from the actual returns that there had been collusion among officials. For instance, the collectors of the neighboring counties of Worcestershire, Herefordshire, Warwickshire, and Oxfordshire would seem to have agreed to collect from about four-fifths of the number of persons paying in the preceding poll tax. It would seem that the collectors of the West and North Ridings of Yorkshire tried to collect about one-half. Similarly the great block of twenty-two groups (64–77.5 per cent) would appear to have collected from two-thirds to three-fourths of the older total. This formula would include, as Oman noticed, about all of the male householders and their wives since many of the householders, particularly the poor, would not be married.[43] In any case the reductions are obviously based upon what must have seemed a reasonable adjustment of the payments under the circumstances. The failure to live up to official instructions in 1381 can hardly impugn the accuracy of the 1377 taxation.

The idea of taxing all adults appears also in Germany. Basel levied such a poll tax upon a number of occasions from 1444 to the end of the century.[44] For one parish (St. Leonard) the total population of 1444

TABLE 52

POPULATION DATA FROM BASEL TAXES, FIFTEENTH CENTURY

Year	Houses	Heads	Haushaltungene	Heads to houses	Clergy, Univ.	Population estimate
1429			2,700			9–10,000
1444		ca. 7,000			300	10,500
1446			3,050	2.3		
1454(1)		5,250			300	8,000
1454(2)			2,000	2.6		
1471–5		5,700	2,100		500	8,700
1497	1,770	5,475			500	9,000

Parish	Heads (a)	The taxes of 1475		Total (d) (a) ×1½	(d)/(b)	(d)/(c)
		Shilling (b)	Steuerpflichtig (c)			
St. Leonard	1,419	468		2,118	4.5	
St. Alban, etc.	1,400	462	497	2,000	4.5	4.2
St. Martin	708	231	223	1,062	4.6	4.8
Klein Basel	945	335	327	1,418	4.2	4.3

Sources: Ammann, A., Die Bevölkerung von Stadt und Landschaft Basel am Ausgang des Mittelalters, *Basler Zeitschrift für Geschichte und Altertumskunde* **49**: 37–39, 1950; Schönberg, G., Basels Bevölkerungszahl im 15. Jahrhundert, *Jbb. f. Nationalök u. Statist.* **40**: 344–380, esp. 346, 1883.

[42] Oman, C., *The great revolt of 1381*, 28–29, Oxford, 1906.

[43] Twice the male householders would be about 77.2 per cent of all payers in 1377. That is, assuming 100 householders to 230 taxpayers, of whom 85 would be male householders (Russell, *BMP*, 62–63), the 230 divided into 170 would be about 73.9 per cent. However, elimination of the fourteeen-year-olds would reduce the total by about 4.3 per cent—thus bringing about 77.2 per cent using the 1348–1375 generation table.

[44] See table 52 for sources. Ammann, 33, 37, and 31 respectively.

TABLE 53

POPULATION DATA FROM AUGSBURG TAXES, 1364–1498

Year	Number of houses (1)	Vacant houses	Taxed persons (2)	Ratio (2)/(1)	Index	Estimate of population
1364	2,249	99	5,176	2.3	3.5	7,500
1408	2,343	46	2,957	1.26	3.5	8,201
1428	2,377	19	4,106	1.7	4	9,508
1461	2,854	76	4,798	1.7	4	11,416
1471	2,836	90	5,109	1.8	4	11,344
1498	3,046	93	5,351	1.76	4	12,186

Source: A. Schreiber, Die Entwicklung der Augsburger Bevölkerung von Ende des 14 Jahrhunderts bis zum Beginn des 19 Jt., *Archiv für Hygiene* **123**: 151, 153, 139, 1939. She multiplies the taxables by five to get an estimate of population.

remains and shows that the population of adults (that is, above fourteen) was 61.5 per cent of the total, rather less than might have been anticipated.[45] The list seems to have included a number of village refugees whose numerous children tended to increase the number below fourteen while undoubtedly more men tended to remain in their villages in the time of danger. Fortunately some other bases of taxes were tried and so provide a comparative basis. The Haushaltungen were apparently simple man-wife-children families and so have about 2.3–5 adults apiece or about 3.5 altogether. The data at the end of the century show about 5.1 to the house and about 4.5 to the *steuerpflichtig* (taxables of a shilling apiece).

A variety of taxation also appears in Augsburg (table 53). The number of vacant houses shows no pressure against housing by the population. Even in 1521 the most *vornehmen* parts of the city show one-story houses even if the majority had two or three-story buildings which probably represented the increased size of the sixteenth century. The taxable persons in 1364 thus number 2.3 to the house. This should mean, if the 2.3 is a family to the house, that all fourteen and over paid the tax, and the total population would be about 7,500.[46] By 1408, although the number of houses has increased, the number of taxables has dropped to 2,957. If the family is still the unit to the house, it would appear that just the head of the family was now being taxed. From 1428 the ratio of house to taxables remains at about 1.7–8, about two members to the family. Normally this should be the husband and wife or, if houses here as some other places are holding more, the husbands and occasional sons or wives. The population estimate is based upon the theory that it is easier to change methods of taxation than methods of living in houses.

[45] See Ammann, 31, 33 and 37.

[46] This idea was current at the time in the Low Countries and in Britain.

The single effort at "national taxation," at the end of the fifteenth century, by Emperor Maximilian I was the "gemeine Pfennig" ordered by the great Reichstag at Worms in 1495.[47] All persons, men, women, lay and clergy, were expected to pay if over fifteen years of age. Those who had possessions worth five hundred guldens or who had an income of twenty-five guldens were to pay half a gulden (Rhenish). Those with greater wealth or income were to pay proportionately more. Those who had less than the minimum were to be grouped into twenty-four-person units with each unit paying a gulden. This arrangement can be checked in two cases. In one the groups averaged about twenty-one to the unit and in another about twenty-four, as the law provided.[48] Many of the records of this tax are (or were) at Frankfurt am Main.[49] This tax was collected in the four years following 1495 and as evidence of population in the case of Basel, at least, seems excellent.[50] The curious method of making a group responsible for a unit sum was like the English poll taxes of 1379 and 1381.

From the Roman period the idea of the poll tax was curiously consistent. It was to be paid by able-bodied workers, both men and women. It usually excluded the feeble in body and mind. Often it assumed that workers had lands, but in some cases this made little difference. By and large we can assume that there was plenty of work and that the relation of workers to total population must have remained much the same. In Roman days the group did not include all of the city population but probably included a considerable fraction of it. Normally the adult group above fourteen would include about two-thirds of the population.[50] Presumably this would be accurate within a few per cent. The addition of city folk in the Roman Empire would push the index based upon the *capita* or the *iugum* from 1.5 to somewhere near 2. In some cases small exempted groups, as the mendicants in England in 1377, must be considered.

4. THE FAMILY AND THE HOUSE

Of all types of demographic information the most common concerns the house or the family which, of course, is an obvious unit to tax. Here again there are two essential problems. The first is of the ex-

[47] Ullman, H., *Kaiser Maximilian I*, 379–380, Stuttgart, 1884. Widmann, H., Die Einhebung der ersten Reichsteuer in Salzburg im Jahr 1497, *Mitt. d. Ges. f. Salzburger Landeskunde* **92**: 1910; Jung, R., Die Akten über die Erhebung des gemeinen Pfennigs von 1495—in Stadtarchiv zu Frankfurt am Main, *Korrespbl. d. Gesamtvereins d. deutschen Geschvereine* **57**: 328–335, 1909, esp. 332.

[48] Jung, as above, **57**: 328–335, 1909. Some were at Schwerin. Grotefend, H., *ibid.* **56**: 476–478, 1908.

[49] Ammann, Die Bevölkerung von Stadt und Landschaft Basel am Ausgang des Mittelalters, *Basler Zeitschrift* **49**: 34–37, 1950.

[50] In Roman Egypt a small sample shows 32.5 per cent below the age of fifteen. Hombert, M., et C. Préaux, *Recherches sur le recensement dans l'Égypt romaine*, 158, Leiden, E. J. Brill, 1952.

empted group—a determination of the number exempted. The second is the fixing of an appropriate number for the index of the unit: that is, the number by which the number of units is to be multiplied to estimate the total.

It may be said that, if the unit is strictly a man-wife-children group, the index should be in the neighborhood of 3.5. This assumes that all adult members of the family, not strictly of the man-wife-children group, such as grandparents, unmarried brothers and sisters, principally, will live separately. If some of these do regularly live in the house then the index figure naturally rises. This necessitates a study of customs of housing and family life to determine what is the normal practice.

The living habits of the people of the Middle Ages necessarily throw some light upon the number of persons to the house. Before the middle of the fifteenth century, we are told, French houses were mostly of wood and of one floor sometimes with an attic above, which naturally lodged only one family.[51] Practically the same thing is said of Valencia for the Middle Ages.[52] Now, of course, the apartment houses of Rome and Ostia are well known and raise different types of questions.

The data for the size of family (man-wife-children under age) come from several parts of Europe and from different times. Below are given the results.[53]

Polyptyque d'Irminon, France about A.D. 820	3.6
England, 1377	3.5
Basel, mid-fifteenth century (Haushaltungen)	3.5
Dresden, mid-fifteenth century (Haushaltungen)	3.3–6
Überlingen, late fifteenth century	3.7

The distribution among households of different sizes can be seen in the case of Überlingen (table 54). These include only adults.

In 1587 the clergy of Spain was asked to send in figures of population for their parishes. Most of the bishops, after collecting from the priests, sent in the numbers in terms of *vecinos* but the Archbishop of Seville included a numeration of all persons:[54] "lugares, é parroquias, casas, vecinos é personas hay." In this case it is evident that all persons rather than all adults are included. Table 55 gives the data for Seville, the four next cities in size, and for the rest of the diocese. Also added in the table are the figures for Madrid of a few years later.

The data unfortunately are not from very representative cities and areas even for the sixteenth century. Seville and Madrid were not only the two largest cities but among the fastest growing as a result of the American trade and as the capital of Spain. This was in a country where the population trend was downward rather than up at the time. Nevertheless, the data do show that the *vecino* at 3.5–8 represented a single man-wife-children family. Since it is the most common unit of population of the sixteenth-century Spanish censuses, it is good to have a well recognized figure. It is thus very curious that historians, even Gonzalez, the editor of the *Censo de Población*, insisted upon using a larger index figure. In general we use 3.8 rather than 3.5–7 to cover probable loss in the collection of data.

It is not easy to distinguish between family, hearth,

TABLE 54

ADULT DISTRIBUTION, ÜBERLINGEN BY SEX AND HOUSING

Number to household	Men as heads	Widows as heads	Women as heads	Total adults
1	50	41	73	164
2	335	15	10	720
3	181	10	2	579
4	78	5		332
5	45			225
6	14	1		90
7	4			28
8	3			24
10	2			20
	712	72	85	2,182
		869		

Source: Harzendorf, F., Die Einwohnerzahl der Stadt Uberlingen um 1500, *Zs. f. d. Gesch. d. Oberrheins*, N.S. **52**: 191, 1939. The 3.7 is secured by adding 50 per cent to the 2.5 average of adults to household.

TABLE 55

PERSONS, HOUSES AND VECINOS FOR MADRID (1597) AND THE DIOCESE OF SEVILLE (1587)

Place	Persons	Houses	Number to a house	*Vecinos*	Number to *vecino*
Seville (city)	120,519	14,381	8.4	26,986	4.5
Ecija, Marchena Osuna, Xerez	73,435	16,162	4.5	20,646	3.6
Rest of the diocese	272,970	62,868	4.3	75,382	3.6
Total	466,929	93,461	5	123,014	3.8
Madrid	45,422	7,016	6.5	11,859	3.8

Source: *Censo de población*, 334–336.

[51] Lot, *Recherches*, xi quoting Commandant Quennedey.

[52] Rodrigo Portegas, J., La urbe valenciane en el siglo xiv, III Congreso de historia de la Corona de Aragon, *Actas y memorias* 1: 302, Valencia, 1923.

[53] For the Polyptyque d'Irminon see table 5; England, Russell, *BMP*, 26–32; Basel, table 52; Dresden, Richter, 277–281, esp. Tabelle III; Überlingen, table 54. Another case, that of an early gift to a monastery of a village, seems to fall in the same class. The village had 100 messuages and 169 adults. If there were an equal number of persons under twenty there would then be 338 persons for an average of 3.38 to the messuage. Lot, F., La grandeur des fiscs à l'époque carolingienne, *R. belge de Philol. et d'Hist.* **3**: 5, 1924.

[54] Censo de población, 96. L. Torres Balbas discusses this problem for the Mohammedan cities in his study Extensión y demografía de las ciudades hispanomusulmanas, *Studia Islamica* **3**: 51–53, 1955.

TABLE 56

TAX RETURNS, DRESDEN, 1396–1501

Year	Able-bodied	Year	Able-bodied	Houses	Ratio	Year	Able-bodied	Houses	Ratio
1396	657	1431	694	420	1.65	1465	657	443	1.48
1401	609	1440	528	412	1.28	1477	687	464	1.48
1411	510	Feb. 1453	544	424	1.28	1489	734	472	1.56
1421	455	Sep. 1453	594	424	1.40	1501	503	467	1.08

Source: Richter, 275.

and house. Notice, for instance, some data for the Low Countries and the Empire. In 1514 the number of persons to the hearth in the county of Holland was 3.68, which is very close to the small family size.[55] At Ypres the unit varied in the fifteenth–sixteenth centuries and may be compared with those of certain central European cities.[56]

Ypres, 1412	3.3	Freiburg i.Ü., 1444–7	4.14
Ypres, 1437	3.7	Nürnberg, 1449	4.89
Ypres, 1491	4.3	Nordlingen, 1459	5.5
Ypres, 1506	4.1		

The marked difference in time at Ypres and from Ypres to the others probably is to be explained in terms of climate. It was probably getting colder at Ypres and was probably colder in the Central European winter than farther west.

The problem of the number to the house in Germany is well illustrated by the evidence from Dresden (table 56) where for a time both the number of houses and the number of able-bodied men (*Geschosspflichtige*) were collected. The sudden loss recorded for the year 1501 was apparently the result of the terrible fire of June 15, 1491,[57] which apparently offset the advantage gained by the coming of the Albertiner house in 1485. Fortunately, the total population of a part of the city remains for 1431 which shows 458 persons with 139 *Geschosspflichtige*.[58] This gives about 3.3 persons to each of the able-bodied in the district. The number to the house then in the city should have been about 5.3; for the lowest ratio of 1.28, the average to the house would have been 4.2. This assumes that the rules for accepting men remained the same, an assumption somewhat discounted by the two censuses of 1453.

An early tax which in theory rested upon houses was Peter's Pence, a tax paid to the pope by Christians in certain countries. The origin is related as follows:[59]

> The due was probably established through the initiative of some Anglo-Saxon king. By the closing years of the ninth century it was in all probability a going concern. Early in the tenth century its payment was being enforced by royal authority. Such are the meagre results of our efforts to penetrate the obscurity which surrounds the early history of the institution.

In England it quickly became a fixed sum (£199 6*s* 8 or 47,840*d*) although much more than the sum delivered to the pope was apparently collected. It was also collected from the wealthier families rather than from all.[60] The total amount of the tax may have some demographic significance in its origin,[61] but ceased thereafter to have any except to indicate what principles of collection may have to be watched for elsewhere, notably in the Scandinavian countries and Poland, to which this tax spread centuries later.

In Sweden, Peter's Pence varied in amount in the fourteenth century: the parish priests were said to have collected the pennies from their parishioners.[62] The author of the *Befolkning i Middelalderen* assumes ten persons to the penny (five to the household, half kept in the parish?). If we assume four to the penny the population was as in table 57. This certainly is a small population. The largest city at the time was probably Wisby. Its thirteenth-century walls seem to have enclosed about fifty-six hectares,[63] a relatively large area in the north. At even one hundred to the hectare, the population would be 5,600, which suggests a total number of people in Sweden of about 380,000. However, the problem is complicated by the fact that

TABLE 57

PETER'S PENCE, SWEDEN, 1318–1356

Years	Marks	Pennies	Per cent	Population estimate
1318–1350	169–221	40,560–53,040	76–100	162,240–212,160
1351–1353	128	30,720	57.9	122,880
1354–1356	111	26,640	50.2	106,560

Source: Lunt, *Papal revenues* 1: 70.

[55] IX Hist. Congress, *Rapports*, 61 n. 27.

[56] For Ypres: Pirenne, H., Les dénombrements de la population d'Ypres au XVe siècle, *Vjschr. f. Sozial- u. Wirtschaftsgesch.* 1: 14–20, 1903. If there were actually 2,451 houses in 1464 (p. 21) and the population half way between the figures of 1437 and 1491 was about 8,508, the houses then held only about 3.47 persons apiece. For Freiburg, IX Hist. Congress, *Rapports*, 59; Nürnberg, *ibid.*, 61; Nordlingen, *ibid.*, 59.

[57] Richter, 277.

[58] Richter, 279.

[59] Lunt, W. E., *Financial relations of the Papacy with England to 1327* 1: 16, Cambridge, 1939. For a good account of the tax see Lunt, *Papal revenues in the Middle Ages* 1: 65–71, New York, 1934.

[60] Lunt, *Financial relations* 1: 68–69; 2: 56–58.

[61] See p. 98.

[62] This assumes 240 pennies to the mark: the same as for the pound. In England the mark was two-thirds of a pound.

[63] Estimated from map in EUI.

TABLE 58

PETER'S PENCE, NORWAY, 1329–1358

Bishopric	Before the plague		After the plague	
	Marks collected	Population estimate	Marks collected	Population estimate
Nidaros	24.32	18,677	20.17	15,491
Bergen	48.33	37,166	37.90	29,003
Stavanger	15.13	11,620	12.66	9,723
Oslo	62.47	47,899	39.98	30,561
Hamar	10.00	7,680	7.77	5,967
Total		123,042		90,745
Ratio		100		73.7

Source: Steinnes, A., Roma-skall og folkstal, *Historisk Tidskrift*, Oslo, **32**: 137–182, esp. 167, 1940. The calculation is made by multiplying the number of marks by 192 times 4, that is, by 768, assuming 4 to the house. It is doubtful whether the average number to the family declined with the plague. Many small households were wiped out, thus reducing the number of housholds somewhat in proportion to the general decline.

Wisby was the center of trade in the Baltic and may have had a larger population than its function as a metropolis for Sweden alone would warrant. It should probably be treated as the metropolis for the Baltic north of the German area.

Peter's Pence data also remain for Norway before and after the Black Death and have been subjected to recent study (table 58). It shows that the payment was recognized as a penny a house and that the mark included 192 pennies. The figures are of the highest amount collected for each bishopric of Norway about 1329–1333 and about 1357–1358. The loss was not as great as the more southern countries suffered. The center of the country was the city of Bergen. Its 8 parishes, at 300 persons to the parish, would have a population of about 2,400. The old harbor area held about 24 hectares[64] in which one might expect about 100 to the hectare and should have been the metropolis for a country of about 160,000 if 1½ per cent of the total. The population must have been sparse even before the Black Death.

TABLE 59

FLORENTINE TAX RETURNS, 1380–1551

Year	Housing unit		Mouths (*Bocche*)	Number of mouths to a house
	Number	Name		
1380	13,074	Poste	54,747	4.2
1424	5,915	Supportanti	30,600	5.2
1469–70	8.250	Supportanti	40,323	4.9
1551	9,556	Hearths	59,557	6.2

Sources: Beloch, *BI* **2**: 134 for 1380; **2**: 136 for 1424; but this is for only a part of the city which may explain the high index; **2**: 136 for 1469–1470 and **2**: 140 for 1551.

[64] Estimated from map in EUI.

TABLE 60

HEARTH TAX RETURNS, VOLTERRA, 1380–1463

Year	Number to a hearth	Total city population	Comitato	
1380	3.4	4,409	4,439	
1412	3.5	3,619	2,862	
1416	4.8	4,888	4,042	
1420	5.	4,838	4,030	
1422	4.3	3,983	3,272	
1427	4.2	3,793	2,957	
1438	4.	3,154	2,378	
1446	5.1	4,112	2,976	
1455	5.4	4,007	2,518	1472–6,052
1463	5.7	4,457	3,122	1550–5,189

Source: Fiume, E., Il computo della popolazione di Volterra nel medio evo secondo il "sal delle bocche," *Archivio storico Italiana* **107**: 3–16, 1949.

5. THE HEARTH TAX

The hearth tax was very popular in western Europe in the later Middle Ages. While it is difficult to say who had the idea of such a tax first, the hearth tax does seem to have been used on a wider scale in Italy earlier than elsewhere. The problem, of course, is the number of persons to the hearth and its relation to the family.

The data upon the number to the hearth in Italy are rather late.[65] In Sicily the number remained about four, even in the sixteenth century. If we may equate the hearth with the *posta,* the *famiglia,* or the *sopportante,* the number is not much higher on the mainland before the sixteenth century. In Tuscany of 1402 the *famiglia* numbered about 4.4.[66] In Parma the hearth of 1502 was about 5.1,[67] while there is evidence that it increased in Florence during the period (table 59). In these circumstances the proper index for the fifteenth century would seem to be about 5, while for the fourteenth it would be about 4 in Italy. The country districts seem to show a smaller index than the cities.

In Italy the situation is well illustrated by data from Volterra, 1380–1463. The problem is slightly complicated in this case because actually the number of people buying salt is considered. Those below the age of three were exempted but they are corrected for. There are two possible reasons, at least, for increasing the number to the hearth: (1) change in buildings eliminating part of the hearths and (2) tendency to exempt widows and the aged. It is obvious that the increasing number to the hearth must be considered in cases where only the hearth number is given. It would appear that there was also some variation in tax-collecting.

[65] Beloch, *BI* **1**: 3. Only a part of the data is given here.

[66] Beloch, *BI* **2**: 190. By 1558–1562 the index had arisen to 4.85, 36,114 divided by 7,443.

[67] Beloch, *BI* **2**: 239; 15,760 divided by 3,072.

From this period a very instructive Spanish documentary set comes from the Valle de Aran in the Pyrenees.[68] Although the number of villages concerned is small, and the total population is only a few thousand, the data preserved are interesting in that they are given by three different designations: heads of families, hearths (*focs*), and houses (*hospicia*). The most numerous is the number of houses, which we assume to number about 3.5 as the usual smallest family unit. The number of the other units can be worked out from a comparison of the numbers as below:

Houses	1,580	3.5
Hearths	1,405	3.9
Heads of families	1,494	3.7

The hearth tax in France apparently occurred first in the south, probably following the example of Italian states, although the idea of taxing houses would be hard to patent. It varied by areas and by provinces even under royal command. Indeed the 1328 hearth tax would seem to have been the only nationwide attempt along this line although it was a fairly common tax from the thirteenth century on. In fact one great problem will be to secure an index for that tax since upon it will depend the one reasonably accurate estimate of total French population. This will involve the matter of exemptions from the tax or, to put it another way, how large a proportion of houses was actually taxed. An accusation against the tax returns, particularly after the plague, was that they are merely taxation units, having no connection with actual hearths. The treatment then will take up the tax by geographical areas before considering the problem of the 1328 question.

In southern France the hearth tax appeared at an early date.[69] In the province of Provence, Count Alphonse began to levy it in 1257. In 1294 the French king announced his right to take it there as an exceptional measure:[70] the poor with less than 50 *sous tournois* were excused.[71] This tax sometimes appears under other names such as *albergue* or *cavalcade*.[72] Some places had their tax fixed at a given amount. This was nearly always true of *cavalcade* and probably in a majority of cases of *albergue* although in many it was set at so much to the house, usually 12*d* or a shilling.[73] There does not seem to have been much question of exemptions in Provence so that the number can probably be multiplied by four with reasonable belief that the total is fairly accurate.[74]

TABLE 61

TAX DATA, CARCASSONNE, 1304

Taxables	1,293 × 3.5	4,521
Too poor	843 × 3.5	2,951
Clerks	250 × 1	250
Exempt	149 × 3.5	521
Total	2,535	8,243

Source: Devic et Vaissete 9: 268: Lot, *Recherches* 1: 405.

In eastern Languedoc there is considerable and interesting evidence. The earliest regarding details comes from Carcassonne in 1304, broken down in table 61. The assumptions are as follows. Three groups are normal household groups and may be multiplied by 3.5.[75] Clerks would in part have their own households but would probably in many cases be living with families registered in the taxable group. If this case was typical, hearth lists of Languedoc would have to be multiplied by 6.4, assuming that such exemptions were normal. However, the exemptions include 43 nobles, 63 notaries, 9 doctors, 12 Lombards, 30 Jews, 40 sergeants, 9 priests, and 15 lawyers. It is obvious that very few of these professional people will be found in the villages and, indeed, only a few of the clergy. Carcassonne also would seem to be exceptional at this period in having so many poor, but the country had hardly recovered from the Albigensian Wars.

Now the total number of hearths in 1296 in the *sénéchausée* of Carcassonne without the county of Foix is given as somewhat more than 90,000.[76] Since the number of hearths for the *sénéchausée* was 108,400 in 1328, the increase was about 20 per cent. This was a very marked increase at a time when one might have anticipated practically a stationary population. If we assume that the 1328 hearth represents four persons and that there had actually been no increase, the number to the hearth in 1296 would be about 4.84. Since it is unlikely that the index was so high, the assumption should probably be that the population was still increasing in the period. Somewhat the same result comes from another calculation, upon the hearth taxes of Beaucaire. In 1294 that city paid 450 *livres tournois*. At six *sols* a hearth[77] this would be about 1,500 hearths. Then in 1339 the city paid for 2,075

[68] The documents are at Barcelona, A. C. A. Perg. Jaime II, nos. 3130–3169, 3220. They are published by J. Reglà Campistol, Cuestiones demográficas del Valle de Aran en la Edad Media, *Pirineos* 4: 497–511, 1948 and also in his *Francia, La Corona de Aragón y la frontera pirenaica* 1: 391–394, Madrid, 1951.

[69] Devic et Vaissete 6: 901; 9: 739. It may have been levied earlier by Raymond VII, *Ibid.* 8: 1491.

[70] Devic et Vaissete 9: 174–175.

[71] Dognon, P. Variations du sens du mot 'feu' du XIIIe au XVe siècles, *Les institutions politiques et administratives du Pays de Languedoc* 4: 619–631, esp. 625, Toulouse, 1895.

[72] See seventeenth-century statement citing early examples. Paris, B. N. MS *fr 26,458*, fos. 104–135.

[73] *Ibid.* The expressions are *par feu, par famille, par chascune famille saison feu.* Apparently no large scale exemptions occurred until 1345.

[74] On the theory that each family was included. There were probably exemptions of clergy, etc.

[75] Since even the poor are listed here.

[76] Devic et Vaissete 9: 194.

[77] *Ibid.* 9: 174–175. However, the city bargained so that the number may be low.

hearths.[78] It seems very unlikely that the city grew over one-third in the period, the obvious interpretation of the data. If we assume that the 1339 tax was virtually complete and that each hearth represents 4 persons, the population of Beaucaire was about 8,300. If the population had not increased in the interval each hearth of 1294 should have included 5.5 persons, but still probably too high, although not far from the Carcassonne index. These two instances would tend to show a tightening of taxation in the first part of the fourteenth century. This might be expected in a time when conditions were improving.

The great tax list of 1328 was apparently never used for a real tax so that no returns remain by which its coverage can be controlled. However, from then on in Languedoc there occurred a continual series of reductions by royal consent (table 62). The first revision occurred in 1339,[79] largely because the tax unit of apportionment was raised. This was later called the "old number." In the *sénéchausée* of Beaucaire this reduction was about 11 per cent. The next reduction, called the "new number" marked a further decline of about 12 per cent from the 1328 figure.[80] It came, not after the Black Death as we might have expected, but in 1345–1346 and then remained as a base until about 1366.[81] Since this tax was on homes of persons of some means, it probably did not change much as a result of the plagues.[82] The "new number" was probably not far from the real total of hearths, after the plague of 1348–1350 and thus might well be multiplied by four to estimate the population. If the case of Nîmes is a fair sample (see next paragraph) the number of hearths after 1366 should be multiplied by about six to get the total population. Further reductions in the number of taxable hearths continue until each of the official 200 hearths of about 1405 represents 11 persons. As can be seen in table 62 the reductions varied from area to area.

TABLE 62

FOURTEENTH CENTURY HEARTH TAXES, SÉNÉSCHAUSÉE OF BEAUCAIRE

1328	Old (*a*)	New (*b*)	(*b*)/(*a*)	*Ca.* 1370	*Ca.* 1387–1388
Total 102,268	89,047	76,832	86.3	22,637	7,382.5
V. vig. Beaucaire	3,631	2,113		1,138	416
V. vig. Nîmes	6,043	4,765	78	2,082	753
V. vig. Someyre	4,526	4,337	95	2,004	439
V. vig. Marneys & Viga	2,400	1,730	72	706	161
V. vig. Anduse	4,155	2,933	71	673	154
V. vig. Alest	2,748	2,000	73	1,110	174
V. vig. Usez	7,602	7,389	96	2,565	783.5
V. vig. Baigneux	11,130	11,095	98	1,114	303.5
V. vig. Rochemaure	1,429	1,429	100	637	166
V. vig. S. Andre etc.	1,219	1,063		327	118
V. vig. Aigues Mortes	1,936	1,470	76	666	152
V. vig. Lanel	2,129	2,129	100	715	243
V. bail. Marvejols	1,788	1,419	80	587	1,051
Gevandan	10,562	10,032	98	3,683	
V. de Canourca	522	522	100	210	
V. de Puys-bail. de Velage				1,712	700
V. etc. de Montpellier	14,675	14,675	100	4,421	1,244.5
Bail. et terre de Vivares	15,522	7,731	50	1,674	559

Sources: 1328, see table 105; Old and New, Devic et Vaissete **10**: cols. 1441–1446, "Antiquus numerus focorum senescalli Bellicadii." Taken from Archives de domaine de Montpellier, sénéschausée de Nîmes en général, liasse 2, n.3. There has been some grouping of data here. *Ca.* 1370, *ibid.*, cols. 1441–1442. *Ca.* 1387–1388, cols. 1442–1443. Dognon, *op. cit.*, gives 1378 as the date of the last tax.

[78] Devic et Vaissete **10**: 1443–1444. See also B. N. *MS Languedoc 159,* fo. 24r where 2,034 is given for 1345 and repeated in 1353 (fo. 27v).

[79] See Molinier's long note in Devic et Vaissete **9**: 739–741. For hesitations over this see **9**: 490.

[80] Some returns labelled old and new are listed in Devic et Vaissete **10**: 1441–1446: multiply old by 4.4 and new by five before 1348.

[81] See note 87. This confirmed by data in B. N. *MS Languedoc 159,* fo. 107r where in 1363 Beaucaire paid 2,300 sols at four groats to the hearth or 1725. "Compotus Johannis de Cruce receptoris in senescallo Bellocardii per dominum regem ad levandum subsidium iiii grossorum pro quolibet foco. See also fo. 27v for 1353."

[82] As shown in the case of Albi by G. Prat in *Annales du Midi* **64**: 18–25, 1952.

[83] "In civitate Nemausi cum locis suis annexis iii^{m} cxxi foci antiqui, sed solum contribuere pro ii^{m}." Devic et Vaissete **10**: 1443.

[84] Ménard, L., *Histoire civile, ecclesiastique et littéraire de la ville de Nismes* **2**: 298, Paris, 1750. For dates of reductions in other cities see Devic et Vaissete **9**: 70 note. On the requirements for the tax see Dognon (note 71), 621. The list by name of place, number of hearths and amount of tax is in B. N. *MS Lat. 10,003,* 47 fos.

[85] Ménard **3**: 80 for 1384 and **3**: 147 for 1398.

[86] Ménard **3**: 185–187 and 208. The list is given in full.

What actually happened to the numbers with respect to the tax list can be seen in two instances at Nîmes. The "old number" of 1339 for Nîmes had been 3,121 while the "new number" of 1345 was 2,000, a really tremendous reduction.[83] Yet, as we shall see, this number was actually higher than the total number of households in 1366. In 1366 the city was granted another *reparatio focorum,* a reduction of its official number, this time to 800. Fortunately, the list of tenants remains: it included 870 men able to pay the tax and 656 unable to pay, a total of 1,526.[84] By 1384 the official number was down to 400 and by 1398 to 200.[85] In 1405 the taxables numbered 93 while the non-taxables were 539, a total of 632. The official number seems to have been reduced to 100 shortly thereafter.[86] The tax list thus does bear a relationship to actual payers and indirectly to population. The case is unusual since few cities must have suffered the losses characteristic of Nîmes.

In 1385 a document was written in Béarn which throws light upon the meaning of the tax number of

the hearth there.[87] The inquisition asked how many live houses, how many dead, and how many hearths were taxed in the villages. The inquest included even the houses of the exempt such as the clergy and the nobles. In the case of the *baillage* of Larhan there were (leaving out a few of uncertain value) 456 live houses, 59 dead, and a tax number of 387. If we assume that the total number of houses should be multiplied by 3.5 on the theory that all were included, the average to the tax hearth was only about 4.2. In Béarn, at least, the tax unit can be used for population although for 1385 it is not necessary. From southwest France instructions upon the taking of the hearth tax in 1414 have long been in print and give some evidence of care in their taking. The following are translated from these instructions.[88]

> There follows information made upon the number of hearths of the location of Castel-Sarrasin (Tarn-et-Garonne). . . . And in that very place the said commissioner (of the king of France) wishing to proceed to taking the said information upon the number of hearths . . . caused to come into his presence some of the wise and old men of the said place, to wit, Raymond. Then the same commissioner . . . ordered that each bring to him books of the statements of all of the goods of the inhabitants of the said place in which their names and the values of the goods are described. These shortly thereafter brought the said books in which the names of all the inhabitants of the said place and the values of their goods were described.

Much Norman evidence exists, beginning with the hearth tax of 1326, termed a *fouage*.[89] The returns are given in shillings to each parish, apparently one shilling to a hearth. The thirty-one parishes listed as in the sergeanty of Breteuil paid 1,623 shillings or about 52 to the parish. The thirty parishes in Verneuil show 2,843 shillings or about 95 to the parish. Although these two areas are contiguous, the disparity in number makes them difficult to compare with the returns for the more famous tax list of 1328. They are apparently in or very near the baillage of Gisors which in 1328 had an average of about 90 hearths to the parish.[90] Yet the nearby baillage of Caen had an average of only 52, while the baillage of Rouen (near Verneuil) had about 100 to the parish. As far as this document indicates the collection in 1326 was about as extensive as for that of 1328.

The local report is illustrated by a document of 1356 from Normandy.[91] The heading is: "These are the hearths of the parish of Frey for the year 1356. First. . . ." From other documents[92] the first list should be those who paid the tax, followed by the list of the non-payers. Frey has a total list of sixty-five. From the names it would seem that most of them were men. There is an Aaliz la chivere and probably three jehannes besides some whose names are of uncertain gender. A second report,[93] of 1360, lists eighty-four as paying and nineteen as non-paying, in the town of Blauzac. Of the non-paying, eight had been killed by the English, six were burned out and had moved elsewhere, while four others had left. Only one, a pauper, was left in the town of the nineteen. The impression of rather rigorous collection of the tax is apparent.

The problem of the hearth tax in northern France was apparently approached from a different angle in 1353[94] when a royal measure ordered a tax of three francs a year from each hearth.[95] The poorest would pay at least one franc, the richest more than three francs, payable three times a year. This measure (*le fort portant le foible*), the strong carrying the weak, apparently lasted only a short time, but left some records in the diocese of Reims. Since these records present cases of reduction of taxes up to 9*d*, it seems that they cover the hearth tax and, indeed, the original number for the city of Reims seems about the proper number. The rather large number of exemptions illustrates how such a tax could cease quickly to bear any real relation to population. However, the document also says that 100 hearths of the walled cities should pay as much as 150 hearths of the open country.[96]

We turn then to the problem of the great hearth tax list of 1328. We have seen that the case of Nimes-Beaucaire and that area is rather unusual in setting up a hearth total far different from reality and in not giving the number of non-taxables. In Normandy of the fourteenth–fifteenth centuries the numbers of the several classes are given. The instructions remaining seem to emphasize real hearths. All comparisons between the tax of 1328 and other such taxes show that it was the highest in number and therefore the most far-reaching in its comprehensiveness. The instance of

[87] Raymond, P., *Le Béarn sous Gaston-Phoebus. Dénombrement général des maisons de la vicomté de Béarn en 1385*, Paris, 1873.

[88] Levasseur, 159, quoting Moheau, *Recherches et considerations sur la population de la France*, 352, Paris, 1778.

[89] B. N. *MS fr 25,902*, doc. 1. The heading of the document is, "Parties de la recepte du fouage de la viconte de Verneuil et de la terre de Daunville de lan mil cccxxvi." The document itself is the report of a district collector (unnamed) of local reports from two named collectors for each parish and is apparently the original report. The Verneuil-Rugles group gives 2,805 as the sum rather than the correct 2,843. The Breteuil report is correct.

[90] For the 1328 report see table 105. For the places, see A. Longnon, *Atlas historique de la France*, pl. xiv.

[91] B. N. *MS fr 25,902*, doc. 9. "Ce sont les feux de la paroisse de Frey pour lan mil ccclvi. Premierement."

[92] B. N. *MS fr 25,902*, doc. 10.

[93] *Ibid.* "Ce sont les nons et surnons des habitans de la ville de Blauzac solvables et non solvables et primere les solvables."

[94] Varin, P., *Archives administratives de la ville de Reims* 3: 274, Paris, 1848. 5 Dec. 1363. The document apparently touching much of the diocese is recorded as "Arch de l'archev. lay 46, liasse 168, no. 1. Administration des elus." Also printed by H. Jadart, *La population de Reims et de son arrondissement*, 63–68, Reims, 1882.

[95] Note also (p. 279) "Pour la terre de Ware—imposéez à lv feuz, payables chescun feu iii francs, monte pour an viii^{xx} et v frans."

[96] Varin, *op. cit.*, 276.

Rodez [97] also shows how high the tax was. Under these circumstances it seems probable that the number to the hearth was fairly near to 3.5 (the unit if all were taxed) and thus certainly was 4 or below.

The data for these hearth taxes vary in demographic value. When the full list of households is given including the exempt as well as the *payables,* the list is obviously of great value. Sometimes the list gives indications of the extent of the liability of the people to be taxed. When only the number of the taxpayers is given, the value of the list is naturally less. There seems to be some difference also between the lists from the cities and the lists from the villages in the incidence of poverty and the exemption from taxation: the cities usually have a larger percentage of the quite poor. The time also affects the number of the poor. The years of the war with England saw increased numbers of both *miserables* and *mendiants* in French lists. The differences make generalizations difficult except that the man-wife-children index should be about 3.5–8 and that the other units must be considered in terms of this one.

The data based upon family, hearth, or house are not as accurate as those based on the number of adults or total population. If the family is the unit, the highest accuracy among the less favored units should be available. If no exempted groups exist, the estimate should be accurate within 10 per cent. Even for house and hearth the accuracy should be within 15 or 20 per cent if the index is drawn from areas reasonably similar in date and geographical location.

With the respectable accuracy of the family, hearth, or house as indices may be compared the superior accuracy of the adult or nearly total population, discussed earlier in the chapter. Numerous local variations naturally appear but, in general, these estimates should be accurate within a few per cent. Also mentioned earlier is the altogether erratic character of guesses about total population which, if used at all, should be treated with the greatest caution.

VI. DEMOGRAPHIC RELATIONSHIPS OF THE CITY

The preceding chapter has presented information about the units or index numbers by which the numbers of houses, heads, or hearths must be multiplied in order to estimate population, a process necessary except in those few fortunate instances in which the total population is detailed with some accuracy. Yet, it must be admitted that even with this help only a few parts of the Roman Empire may be estimated with any real hope of attaining satisfactory information. Indeed, with it the population of late medieval Europe is the only phase which can be elucidated properly. For this reason other approaches must be provided or the subject of total numbers in medieval population is still very much a matter of conjecture. With this prospect in mind we turn to a study of the demographic possibilities of the very large amount of information about the size of cities made available by archaeological research and by evidence from maps of present-day cities. If the area of cities can be shown to bear a direct relationship to their population, and their population, in turn, bears a direct relationship to the countries and districts of which they are centres, a vast amount of information is available. Even if it is not so exact a measure as the use of numbers of hearths and head-taxed persons, it still can be very valuable.

The walls were functional in the ancient and medieval world.[1] Since the people lived within the walls and preferred to remain within, the tendency was to live up to the walls rather than to spread well beyond them. There were suburbs but not as many persons lived in them as would live in the outskirts of a city today. Furthermore, the two periods of greatest wall building tended to make them of considerable value in estimating population. The first was in the late third and early fourth centuries when the danger from the barbarians caused many cities to protect themselves by walls. Since the population was declining then, there was no urge to include a greater area than was immediately necessary. The second period was at the time of the great population increase from about A.D. 1000 to the outbreak of the Black Death in 1348. Here again the tendency was to include what was necessary rather than to speculate by enclosing large areas in anticipation of population expansion. There are exceptions when the latter was done. The problem of estimating population from the number of hectares within the walls thus is somewhat simplified since certain standards may be set up based upon the fact that so many were built in the same period and under somewhat the same conditions.

1. RELATION OF SIZE TO CIVIC POPULATION

The best data come from places where archaeological research has traced the growth of cities and can assign accurate estimates for the inhabited areas at specific times. Good data come from places where walls remain which can be dated. There are several such series available.[2] For many cities, at present, the only source is the modern or early modern city plan. In the medieval sections the maps usually show narrow and crooked streets while the configuration of certain streets

[97] See p. 44. For actual payments of 1,328 see Devic et Vaissete **9**: 452. The very high payment of 42,460 1.7 s. ld. of the sénéschausée of Carcassone would only have been (if assessed on 108,400 hearths) about eight solidi a hearth.

[1] Meier, H., Deutsche Stadtmauern, *Deutsche Geschichtsblätter* **14**: 67–86, 1912–1913.

[2] As in the works of Ganshof, *Étude sur le développement des villes entre Loire et Rhin au moyen-âge,* Paris, 1943; Grenier, *Manuel d'archéologie Gallo-Romaine,* Paris, 1931–1934; Lot, *Recherches.*

TABLE 63

AREA AND POPULATION OF MEDITERRANEAN CITIES, LATE MIDDLE AGES

City	Area		Population		Number to hectare	
	In hectares	Date*	Estimate	Date*	Pre-plague	Post-plague
Aix	42		6,000	1324–1346	143	
Albi	100		9,341	1343	93	
Albi	100		5,712	1357		57
Avignon	151	1351	15,340	1539		102
Barcelona	260		27,056	1359		104
Barcelona	260		30,604	1514		118
Bergamo	202		20,843	1549		103
Béziers	45	XII	14,476	1304	322	
Béziers	45	XII	4,280	1418		106
Bologna	419.5	XIV	32,000	1371		76
Carcassone	40	1359	8,243	1304	203	
Carcassone	40	1359	4,957	1372		124
Die	23	Roman	1,723	1450		75
Embrun	8	1368	1,935	1474		242
Fez	320		37,700	Late XIV		118
Florence	512	XIV	54,747	1381		107
Florence	512	XIV	37,225	1424		73
Genoa	293	Early XVI	37,788	Early XVI		129
Lodève	55	XIV	4,028	1305	69	
Lucca	75	XIII	14,300	1331	191	
Mantua	150	1242	26,407	1463		176
Milan	314		52,000	XIII	166	
Modena	72		8,000	1482		111
Modena	150	XVI	18,000	1538		120
Naples	203		22,000–27,000	1278	108–133	
Nîmes	46	Roman	5,341	1368		116
Padua	350	XIV	41,000	1320	117	
Palermo	200	XIII	16,168	1374		81
Parma	201	1250	20,000	1395		100
Parma	201	1250	11,500	1502		57
Perugia	80?		13,000	1529		163
Piacenza	345		25,000	1447		72
Pisa	114	XIII–XIV	13,000	1228	114	
Pisa	114	XIII–XIV	9,940	1551		87
Pistoia	144	XIV	6,000	1351		42
Reggio Emilia	100		9,201	1473		92
Rodez	21	1350	3,864	1350		184
Rome	1,380	III	55,035	1526		40
Siena	101	XIV	16,700	1380–1390		165
Toulon	18		1,512	1285	84	
Toulon	18		2,800	1332	155	
Tunis	97	XIV	28,000	1361		289
Valencia	47+		13,500	1238	287	
Valencia	142	XIV	13,500	XVI		95
Venice	324	XIV	77,700	1363		240
Vienne	36		3,836	1391		107

* The Roman capitals indicate centuries. When no indication of date is given the assumption is that it is of the late Middle Ages.

Sources: Areas estimated from modern maps unless otherwise stated.

Aix, see table 109.
Albi, Prat, G., Albi et la peste noire, *Annales du Midi* **64**: 15–25. 1952, Pop. 1343; 2,669 × 3.5 = 9,341; 1357, 952 × 6 = 5,712.
Avignon, Lot, *Recherches* **1**: 159.
Barcelona, see table 120.
Bergamo, *Ency. Ital.*
Béziers, Lot, *Recherches* **1**: 350–351.
Bologna, Beloch, *BI* **2**: 91–92.
Carcassonne, Lot, *Recherches* **1**: 404–405. 807 hearths × 6.15. That is, the same multiplier as for Nîmes, see p. 57.
Carpentras, Lot, *Recherches* **1**: 219. 672 hearths × 4.
Die, Lot, *Recherches* **1**: 100. 406 × 4 = 1,624 + 199 clerks.
Embrun, Lot, *Recherches* **1**: 233; walls enclosed eight hectares.
Fez, see p. 102.
Florence, Beloch, *BI* **2**: 128, 134, 136.
Genoa, wall circuit of five miles or a little less than six.
Giustiniani, *Annali*, ed. G. B. Spotorno, 60, Genoa, 1854; 6,298 houses, *ibid.*, 72.
Lodève, Lot, *Recherches* **1**: 385, walls included 11 hectares, rest 44.
Lucca, Beloch, *BI* **2**: 165–166.
Mantua, Beloch, *BI* **2**: 287.
Milan, map in *EUI*, see pp. 110–111 for population.
Modena, Beloch **2**: 261.
Naples, area from *EUI*; population from Beloch, *BI* **1**: 170.

Nîmes, Lot, *Recherches* **1**: 372, 1526 × 3.5.
Padua, *Enci. Ital.*
Palermo, map in *EUI*; Beloch, *BI* **1**: 94, 119; 4,082 hearths.
Parma, Beloch, *BI* **2**: 238; map in *EUI*.
Perugia, Beloch, *BI* **2**: 70; map in *EUI*.
Piacenza, Beloch, *BI* **2**: 249; map in Baedeker, *Italy*, 266, 1879.
Pisa, Beloch, *BI* **2**: 161; map in *EUI*.
Pistoia, Beloch, *BI* **2**: 169, map in Baedeker, *Italy*, 337, 1879.
Reggio Emilia, Beloch, *BI* **2**: 269; map in Baedeker, *Italy*, 268, 1879.
Rodez, Lot, *Recherches* **2**: 140. 966 hearths within walls: **2**: 144. 185 outside.
Rome, Beloch, *BI* **2**: 6.
Siena, Beloch, *BI* **2**: 150.
Toulon, Lot, *Recherches* **1**: 199.
Tunis, see p. 130.
Valencia, see p. 104.
Venice, p. 128 for population, map in *EUI*.
Vienne, Lot, *Recherches* **1**: 18.

TABLE 64

AREA AND POPULATION OF ATLANTIC CITIES, LATE MIDDLE AGES

City	Area		Population		Number to hectare	
	In hectares	Date*	Estimate	Date*	Pre-plague	Post-plague
Amsterdam	78	1481–1488	7,476	1470		96
Antwerp	352		13,760	1437		39
Antwerp	352		27,344	1496		78
Bordeaux	275	1297–1326	43,000	1696		(156)
Bourges	115	1180–1223	32,350	1487		289
Bruges	430		25,000	1340	58	
Brussels	360	Mid XIV	29,656	1437		82
Brussels	449	XV	19,058	1496		42
Canterbury	40	XIV	3,861	1377		97
Ghent	644	Late XIV	50–60,000	1356		78–93
Grenoble	20	XIV	1,862	1383		93
Grenoble	20	XIV	2,170	1475		108
Haarlem	80		9,094	1470		114
Hague	96	XIV	5,392	1370		56
Hull	33	XIV	2,336	1377		71
Laon	40	XIII	6,720	XIII	168	
Leicester	40–50		3,152	1377		79–63
Liege	80		8,000	1470		100
Lincoln	67		5,354	1377		80
London	166	XI	17,850	1086	108	
London	288	XIV	34,971	1377		121
Louvain	410		10,828	1374		27
Louvain	410		14,316	1437		35
Newcastle-on-Tyne	90	XIV	3,970	1377		44
Norwich	85	XIII	5,928	1377		70
Paris	378	1292	59,200	1292	157	
Périgueux	40		6,000	1342	150	
Reims	196	1358	11,116	1363		57
Toulouse	212	XIII–XIV	25,964–22,136	1385–1405		122 104
Winchester	55		2,160	1377		39
York	84	Late XIII	10,872	1377		129
Ypres	112		12,220	XV		109

* The Roman capitals indicate centuries. When no indication of date is given the assumption is that it is of the late Middle Ages.

Sources: Amsterdam, hearths 1,869; map in Dickinson, 162.
Antwerp, hearths 3,440, IX Hist. Congress, 80; map in Dickinson, 366.
Bordeaux, Lot, *Recherches* **2**: 396–397.
Bourges, Lot, *Recherches* **2**: 73–74.
Bruges, IX Hist. Congress, 80; area in Van Werveke, H., *Gand*. 46, Brussels, 1946.
Brussels, IX Hist. Congress, *rapports*, 80; map in Dickinson, 143; area in Van Werveke, *Gand*, 46.
Canterbury, Russell, *BMP*, 142; walls, Stephenson, C., *Borough and town*, 187.
Ghent, Van Werveke, *Gand*, 46, 65.
Grenoble, Lot, *Recherches* **1**: 60–62.
Haarlem, 2,526 hearths, IX Hist. Congress, 80; maps in *EUI* and Dickinson, 338.
Hague, 1,348 hearths, IX Hist. Congress, 80; map in *EUI*.
Hull, Russell, *BMP*, 143; map in F. Snyder's Ph.D. thesis, Univ. New Mexico, 1952.
Laon, map in Dickinson, 44.
Leicester; Russell, *BMP*, 142; Stephenson, *Borough and town*, 187.
Liege, IX Hist. Congress, 80; map in *EUI*.
Lincoln, Russell, *BMP*, 142; Stephenson, *Borough and town*, 192.
London, Russell, *BMP*, 51, 142; maps in Stephenson, *Borough and town* 187; and Bird, R., *The turbulent London of Richard II*, London, 1949, map by M. B. Honeybourne.
Louvain: Van Werveke, *Gand*, 46; Cuvelier, cxvi.
Newcastle-on-Tyne, Russell, *BMP*, 142; maps in *EUI* and Guthrie, J., *The river Tyne*, 23, Newcastle, 1880.
Norwich, Russell, *BMP*, 142; Stephenson, *Borough and town*, 198.
Paris, see p. 107.
Périgueux, Lot, *Recherches* **2**: 602.
Reims, 2,647 hearths, Boussinesq, G., and G. Laurent, *Histoire de Reims* **1**: 384, Reims, 1933; Varin, P., *Archives administratives de la ville de Reims* **3**: 277, Paris, 1848.
Toulouse, Dickinson, 110; see p. 119.
Winchester, Russell, *BMP*, 142; Stephenson, *Borough and town*, 187.
York, Russell, *BMP*, 142; Stephenson, *Borough and town*, 191.
Ypres, see table 49, map in Dickinson, 366.

show where the wall or walls have been. These data about walls and city size are naturally not as accurate as direct information about city population, but they help in many cases where no such information is available and even when large and otherwise uncontrolled figures are given.

Nevertheless, it is clear that in the present state of information about the extent of population at various times for most of the cities of Europe and of the Mediterranean world, the problem of securing exact data will be difficult. For instance, a rapidly growing city moves to and beyond the walls and makes difficult the determination of the relationship between the area within the walls and the total population. Thus, if only a relatively stable relationship occurs in the data, it should be useful as a check upon the type of wild guess which appears so frequently even in the reports of the Venetian ambassadors, trained observers though they were. In tables 63–66 the value then will appear if there seems to be some average toward which the figures tend to converge. It would indicate a common density of population if areas can be accurately estimated.

Table 66 shows at first sight a considerable dispersal of values by geographical division and by size. The divergencies from the average or at least the mode can

TABLE 65

AREA AND POPULATION OF CONTINENTAL CITIES, LATE MIDDLE AGES

City	Area		Population		Number to hectare	
	In hectares	Date*	Estimate	Date*	Pre-plague	Post-plague
Altenburg	24		2,800	1440		117
Arnstadt	38		3,600	1457		95
Augsburg	178	XIV	18,300	1475		103
Basel	100	1400	10,000	1446		100
Beaune	37		3,072–1,896			83
				XV		51
Berlin	87	1400	6,000	1450		69
Bern	36		5,000	1448		139
Breslau	122	1330	14,000–15,000	1403		115–123
Brunswick	115	1150	15,000–17,000	1403		130–148
Chemnitz	19		2,330	1466		123
Cologne	397	XIII	31,000	1550		78
Danzig	104.5	Early XV	11,775	1416		113
Dijon	104		8,235	1376		79
Dijon	104		10,088	1469		97
Dresden	56		3,745	1396		67
Dresden	56		2,228	1501		40
Frankfurt-am-Main	128		9,844	1410		77
Freiburg			5,000	1470		104
Freiburg-in-Üchtland	78		5,800	1447–1448		74
Geneva	30	*Ca.* 1364	4,204	1404		140
Görlitz	72		7,800	1426		108
Görlitz	72		10,600	1533		147
Hamburg	204	*Ca.* 1250	22,000	1419		108
Heidelberg	36	XIII	5,200	1439		144
Leipzig	42	XIII	2,076	1474		49
Leipzig	42	XIII	2,936	1489		70
Lübeck	107	*Ca.* 1217	17,881	1460–1461		167
Lüneburg	84	1200	8,000	*Ca.* 1300	95	
Mainz	120	XIII	5,767	1500		48
Mecklenberg	69	XIV	11,000	1380		159
Meissen	22		2,100	1481		96
Mühlhausen	60		7,000–9,000	XV		117–150
Northeim	24.3	1305	2,916	1338	120	
Nürnberg	138	XIV	16,568	1431		120
Nürnberg	138	XIV	22,800	1449		165
Osnabrück	50	*Ca.* 1200	4,800	1425		96
Rostock	68	*Ca.* 1300	14,000	1410		206
Salzburg	58		7,000	1497		121
Stadthagen	21	XIV	2,040	1382		97
Stettin	63		9,000–9,500	1350, 1470		143–151
Strasbourg	193	By 1441	20,722	1474		107
Trier	144	XIII	8,000–9,000	XV		56–63
Ulm	74		20,000	1427		270
Wismar	58		8,000–9,000	1475		138–155
Wittenberg	23	1323	2,146	1500		93
Würzburg	48		2,800	1409		58
Zittau	35	1277–1287	5,000	1400		143
Zürich	70		7,399–8,576	1357–1410		106–124

* The Roman capitals indicate centuries. When no indication of date is given the assumption is that it is of the late Middle Ages.

Sources:

Altenburg, Keyser, DS **2**: 264–265.
Arnstadt, Keyser, DS **2**: 269.
Augsburg, Püschel, 209; Keyser, *BD*, 264.
Basel, area estimated from von Seidlitz, *Geog. Handbuch Europas*, 91, 1931; Keyser, *BD*, 265.
Beaune, see table 129; map in Fleure, H. J., *Geog. Rev.* **10**: 361, 1920.
Berlin, Keyser, DS **1**: 484–485.
Bern, Schmidt, G. H., Die Bevölkerung von Bern und Freiburg i.U. im 15. Jahrhundert, *Zs. f. d. ges. Staatswiss.* **58**: 179, 1902.
Breslau, Püschel, 210; Keyser, *BD*, 264.
Brunswick, Püschel, 210, Keyser, *BD*, 264; *Neues Archiv für Niedersachsen* 353, 1953.
Chemnitz, Keyser, DS **2**: 35–36; map in Baedeker, *Deutschland*, 142–143, 1906.
Cologne, Püschel, 209, Keyser, *BD*, 264.

Danzig, Keyser, DS **1**: 34–35, inhabited areas; Keyser, *Danzigs Geschichte* 38, Danzig, 1921. 2,355 steuerphlichtige times five.
Dijon, see table 129, map in Dickinson, 340–344.
Dresden, Keyser, *BD*, 265; map in *EUI*.
Frankfurt am Main, IX Hist. Congress, 80; Püschel, 210.
Freiburg, Keyser, DS **2**: 77, 78.
Freiburg-im-Üchtland, Schmidt (under Bern above), 179; map in *EUI*.
Geneva, Lot, *Recherches* **1**: 38; map in von Seidlitz (see Basel above), 92.
Görlitz, Keyser, *BD*, 265; map in *EUI*.
Hamburg, Püschel, 211; Keyser, *BD*, 264.
Heidelberg, Keyser, *BD*, 265; map in *EUI*.
Leipzig, Püschel, 211 (without suburbs in east and south); Keyser, *BD*, 265.
Lübeck, Püschel, 210; Reisner, W., *Die Einwohnerzahl deutscher Städte*, etc., 45–46, Halle, 1902. Haushaltungen at 3.5 apiece.
Lüneburg, Keyser, DS **3**: 229, 230.
Mecklenburg, Keyser, DS **1**: 324.
Meissen, Keyser, DS **2**: 151.
Mühlhausen, Vetter, A., *Bevölkerungsverhältnisse der ehemals freien Reichstadt Mühlhausen*, etc., Leipzig, 1910; map in *EUI*.
Northeim, Keyser, DS **3**: 258. Population, 486 × 6 for 1338.
Nürnberg, Püschel, 209; see table 9.
Osnabrück, Keyser, DS **3**: 279.
Rostock, Püschel, 210; Keyser, BD, 264, probably much too high an estimate.
Salzburg, Widmann, *Mitt. d. Ges. f. Salzburger Landeskunde*, 96, 1910; map in *EUI*.
Stadthagen, Keyser, DS **2**: 342–343.
Stettin, Keyser, *BD*, 265; map in Baedeker, *Deutschland*, 60, 1909.
Strasbourg, Püschel, 209; Keyser, *BD*, 265.
Trier, Dickinson, 338; Keyser, *BD*, 265; map in *EUI*.
Ulm, Püschel, 211; Keyser, *BD*, 264, estimate probably too high.
Wismar, Püschel, 210; Keyser, *BD*, 265; note that in 1799 it had only 5,940.
Wittenburg, *Speculum* **23**: 102, 110, 1945.
Würzburg, Keyser, *BD*, 265; map in *EUI*.
Zittau, Keyser, DS **2**: 238–239.
Zurich, IX Hist. Congress, 80; Daszynska, S., Zürichs Bevölkerung in XVII Jahrhundert, *Zs. f. Schweiz. Statis.* **25**: 371, 1889. *Steuerlisten* and Kriegsrodel multiplied by 3.5 instead of 5.

often be explained by circumstances. Several of the larger cities built wide expanses of wall in the fourteenth century and thus naturally had a low density. In some cases the estimate of population is evidently too high. After all, the period from 1200 to 1550 experienced very severe changes in population and adjustments were often not made in the walls. However, the history of most of the cities is so well known that corrections in estimates can be made. No one, for instance, would judge fourteenth-century London by its eleventh-century wall. It might be expected that the ancient world which apparently did not experience such a tremendous change might conform more closely to the average even if the cities of Gaul do show such great divergences between the first-century and later walls.

For the period, then, after the Black Death and for most of the fifteenth century population did not change much. On the average it tended to be between 100 and 120 to the hectare. Let us assume that the average for houses in the cities was 110. This allows the amount above that figure to care for streets, churches, public buildings, and other areas not used for residence. By and large medieval cities possessed few public areas beyond the central square. Then we may assume that the average city house held about 4 persons which would give 25 houses to the hectare. The authorities concur in stating that most houses of the period were small and seldom over two floors in height (ground and one above). The burgages or city lots on the average covered 400 square metres: if narrow and long a typical lot would be 10 by 40 metres in size.

TABLE 66

DISTRIBUTION OF CITIES BY SIZE AND DENSITY OF POPULATION, 1348–1550

Number to hectare	0–80	81–125	126–75	176–	Total
Mediterranean cities	6	15	3	5	29
Atlantic cities	10	10	1	1	22
Continental cities	11	19	9	2	41
Cities, 1–50 hectares in area	6	14	4	2	26
51–100 hectares	9	10	5	3	27
101–200 hectares	6	10	3	2	27
201– hectares	6	10	1	1	18
	27	44	13	8	92

Sources: tables 63–65. The first number is used when more than one post-plague estimate is available.

For the period before the Black Death there is the problem of a somewhat larger population. If the number of houses remained the same there should be about six to the house. Now the fifteenth-century evidence tends to show an increasing number of persons to the house, particularly in central Europe. The English poll tax of 1377 shows a very large number of persons living in cottages, many probably of quite fragile and almost temporary character. Thus, the decline in population might simply mean that a large number of these small huts or cottages were no longer used and thus the number of houses declined about in proportion to the decline in population. Many of the cottages may well have been in the lots at the back of the house. One of the problems of demographers lies in the difference of house and burgage where the latter contained, as must often have been done, both a sizable house by the standards of the day and a hut at the back. In short, a lot area of about 400 square metres would indicate an average of 100 to 150 persons to a hectare.

2. THE ROMAN CITY

The archaeological problem is primarily the question of the number of persons who may be assigned to each hectare of land in Roman cities. This may be estimated from the number of houses excavated on sites

which have been the subject of careful archaeological investigation. Presumably on other sites either the number found in comparable cities or perhaps an examination of later street locations may assist in establishing the relative numbers. An illustration from Britain shows the differences in density which occur. The city of Silchester (*Calleva*), the tribal center of one of the tribes, which has been excavated, shows only 80 houses in 41.5 hectares, some very small and poor. One can hardly assign more than 4 persons to the house which would give only about 320 persons, or less than 10 to the hectare. Caerwent, on the other hand, has about 100 houses to its 17.6 hectares or about 25 persons to the hectare. The site of Alesia in France has been excavated in part: some 20 huts occupy about half a hectare. At 3.5 to the hectare this would be about 140 to the hectare, but after all, it was crowded for the siege by Caesar.[2a]

The number to the family and house can be estimated accurately only from a relatively small sample from Egypt, which had the reputation of being the most thickly populated province. The poll tax returns show 688 persons for 117 ménages[3] or about 6 to the place of return. These are presumably for courts. However, if one examines the sample of 17 places in one document, he finds that the total is 64 persons[4] or about 3.8 to the house or part of the house indicated in the return. In two cases it would seem that the house held 2 families[5] and in a third 4 families with 17 persons. The total of 22 families with 64 persons would give 2.9 persons to the family. It seems evident that the normal custom was for a man-wife-children unit to live by itself.[6] Even when several of these groups lived in a court, it was probably in one-story apartments about the court. It seems best then to multiply the number of apartments by 3–3.5 and the number of courts or houses by 6 to estimate population.

The information about the Mesopotamian frontier city of Dura-Europos throws some light upon density of city population.[7] The city was apparently founded about 300 B.C. but experienced great prosperity and filled the area within the walls in the early days of the Roman Empire. The walls seem to have enclosed about 53 hectares. The blocks were very regular averaging about 79 by 42.5 metres and thus had areas of about 3,357.5 square metres. From the evidence presented in the plans of the city it would seem that there were about 10 houses to the block and thus the lots and houses averaged about 336 square metres. The houses were mostly built about an atrium and were apparently but a story in height. The city plan shows about 110 blocks: several were occupied by temples and public buildings but several may not appear in the plan. If we assume about 6 to the house (much like the medieval burgage) we have a population of about 6,600. This would be about 125 to the hectare which we found was just above the average for medieval Europe after the Black Death.

The dimensions established in the early years of a city naturally tended to remain. At Olynthus a group of three city blocks consists of a plot 89 by 117 metres (including adjacent street areas). This area of 10,413 square metres contains apparently 30 houses. This gives an average of 348 square metres for the house and lot.[8] Excavations at Ostia and Rome show that houses must be allowed at least 300 square metres apiece.[9] Estimating from the excavated sections at Pompeii, there seem to be about 147 blocks with about 12 houses to the block, a total of 1,764 houses. Dividing this number into 66 hectares gives about 374 square metres to the house. Since some of Pompeii contained the forum and other public buildings, the average area of a house was probably near 350 square metres. In the parts heretofore excavated there is little indication of crowding. Some of the houses had upstairs rooms but they seem exceptional. One should consider a maximum of 6 persons to the house which would then give Pompeii an estimated population of about 10,584.[10] This gives about 160 persons to the hectare, a proper figure for a growing small city.

The most detailed information about the city of Rome in classical times comes from the middle of the fourth century from the *Regionares*,[11] descriptions of the city. The city blocks (*vici*) numbered then about 307, the houses (*domus*) about 1,790, while the *insule* are given variously as 44,200, 44,300, and 46,200.[12] Using the common terms in the three versions, we have 44,200 *insule*. The term *insula* is defined in the standard

[2a] Grenier, **2**: 704. Alesia covered about 97 hectares (p. 703).

[3] Hombert, M., et C. Préaux, *Recherches sur le recensement dans l'Égypte romaine*, 154–155, Leiden, Brill, 1952.

[4] *Ibid.*, 3–37.

[5] *Ibid.*, 13 (one person apparently unrelated to seven others, man, wife, five children); 31 (man-wife-child; widow and two children); 22 (four brothers with wives and nine children, each family listed consecutively).

[6] The families numbered as follows:

Number in family	1	2	3	4	5	6	7
Number of families	4	7	4	4	1	1	1

[7] Rostovtzeff, M., *Dura-Europos and its art*, Oxford, 1938. The map or plan of the city is opposite p. 41. The scale was adjusted from diagrams opposite p. 44, on 45 and on 47.

[8] *R. E.* supplementband **7**: 255; see also Wycherly, R. E., *How the Greeks built cities*, 187–192, London, Macmillan, 1949; Lavedan, P., *Histoire de urbanisme* **1**: 215, Paris, 1926.

[9] Calza, G., La preminenza dell 'insula' nella edilizia romana, *Monumenti Antichi* **23**: 544–607, esp. 601 and 605, 1914; Lugli, G., Scoperte di antichità a Piazza Colonna, *Notizie degli scavi di Antichità*, opp. 16, Rome, 1917. R. Accademia dei Lincei.

[10] From map in Mau, *Pompei*, New York, 1902. For larger estimates of size see Frank, *ESAR* **5**: 252 and Carrington, R. C., *Pompei* **8**, Oxford, 1936.

[11] Edited many times, most recently by Valentini, R., and C. Zucchetti, *Codice topografice della città di Roma* **1**: Rome, 1940 and by A. Nordh, *Libellus de regionibus Urbis Romae*, Lund, Gleerup, 1949.

[12] The specific documents are called the *Breviarium* (46,200), the *Notitia* (44,200 of about A.D. 334–357) and the *Curiosum* (44,300 of about A.D. 357 and later).

dictionaries as either apartment house or apartment which, of course, has not prevented a controversy over the meaning.[13] However, as we have seen, the area upon which an apartment house or any house was usually built covered at least 300 square metres. Multiply this by 44,200 and the result is 1,326 hectares—impossible thus to indicate apartment houses since the total area of Rome was only 1,386. It seems clear then that the term *insula* can mean only apartment or (in terms of the later Middle Ages) a hearth.

The problem then is to estimate the population of the city in terms of these figures. The apartment is a very small unit and can hardly have held, on the average, more than the simple man-wife-children unit which is usually 3.5. On the other hand, the *domus* was an independent unit and is much harder to estimate. Nevertheless, the number of these houses is sufficiently great so that it probably included many relatively middle-class people. Ten to a house is perhaps about the proper number. This would give the following number:

44,200 × 3.5	154,700
1,790 × 10	17,900
Total	172,600

At 1386 hectares the average would be about 125 to the hectare. This raises a problem since Rome was known for its great apartment houses swarming with people. Yet it has been recently shown that Rome had only a few quite semi-rural suburbs.[14] Even within the city one can estimate the following non-inhabited areas:

Streets	138 hectares
Campus Martius	60
Gardens	98
Public Buildings	84
Warehouses	24
Tiber River	22
	426

This in itself leaves only 970 hectares or about 200 persons to the hectare: by medieval standards a relatively crowded city. One has to expect that the fourth-century city would be somewhat smaller in size than the earlier city.

One reason for believing that Rome had a very large population is the statement of the biographer of Septimius Severus that that frugal emperor at his death in 211 left a seven-years' *canon* of grain.[15] Since this information is corroborated elsewhere it seems reasonably certain.[16] Now the statement may read, "Dying [Septimius Severus] left a *canon* of seven years, with the result that they could pay out 75,000 *modii* of grain daily."[17] Recently it has been suggested that the *canon* was only a part of Rome's grain, merely the part purchased by the government. It thus did not include the tribute grain from Africa and Egypt.[18] As read above the amount available (48,884,000 *modii*) would have nothing to do with the actual distribution since it is unlikely that seven-years' supply would be doled out in one year. If divided by seven, it would furnish at 4 *modii* a month[19] about 145,000 persons a year with the customary grain. If the *canon* was only a part of the grain the city was obviously larger. If the estimate that the *canon* was about 56 per cent of the total supply,[20] the city should have had a population of about 260,000. This would show a population averaging about 190 to the hectare, still a densely settled city.

The city of Rome had probably been larger in the first century A.D. Pliny stated about A.D. 74 that its area was encircled by a perimeter of about 13,200 paces[21] which, at 1.48 metres to the pace, would be about 19,500 metres. Since this was about the length of the Aurelian Wall the city seems to be nearly the size that it was two centuries later and included about 1,380 hectares. It was probably even more concentrated since it is alleged to have had only 265 *vici* then.[22] No wonder Herodian suggested that the tremendous palace of Nero was as large as the rest of the city.[23] The *Monumentum Ancyranum* bearing Augustus' autobiography of official acts states that he paid a gratuity to 320,000 of the urban *plebs* in 5 B.C. and had 200,000 of the same on the public rolls in 2 B.C.[24] The first figure may not be far from the total population of Rome at the time. If it were 350,000 the number to the hectare would be about 250, a large number. If the

[13] In favor of the term meaning apartment house: Calza, G., La statistica delle abitazioni ed il calcolo dela popolazione di Roma imperiale, *Rend. della R. Accademia dei Lincei* **26**: 60–87, 1917; Calza, G., e G. Lugli, La popolazione di Roma antica, *B. della comm. arch. del governo di Roma* **69**: 1941; Carcopino, J., *Daily life in ancient Rome,* 14–31, New York, 1941. Against: Cuq, E., Une statistique de loceaux affectes à l'habitation dans la Rome impériale, *M. de l'Acad. des Inscriptions* **9**: 279–335, 1915; Lot, F., Rome et sa population à la fin du IIIe siècle de notre ére, *Ann. d'Hist. Soc.* **7**: 29–38, 1945. A completely pessimistic view of urban estimates is given by Meyer, F. G., Römische Bevölkerungsgeschichte und Inschriftenstatistik, *Historia* **2**: 318–351, 1954.

[14] Homo, L., *C. R. Acad. Inscript,* 293–308, esp. 297, 1933.

[15] *Vita* 23.2. Quoted by Frank, *ESAR* **5**: 87.

[16] *Hist. Aug.* Sept. Sev. 8; Heliog. 27.

[17] "Moriens, septem annorum canonem, ita ut cotidiana septuaginta quinque milia modium expendi possent, reliquit."

[18] Oates, W. J., The population of Rome, *Classical Philology* **29**: 101–116, esp. 110–111, 1934.

[19] Oates seems to make it clear that this was the distribution. *Ibid.,* 105–107.

[20] Oates, 115–116.

[21] *Nat. Hist.,* III, v, 66. Frank, *ESAR* **1**: 330.

[22] Carcopino, J., *Daily life in ancient Rome,* 16. He notes that Jerome (Chr. II, 133, ed. Schoene) gives the population of Rome in 86 B.C. as 463,000. He believes that this refers to the city alone, but it might have included a larger area. See p. 48.

[23] This item was noticed by D. Hume in Essay XI, On the populousness of ancient nations, *Essays moral, political and literary,* ed. Green and Grose, **1**: 429, London, 1875.

[24] *Mon. Ancy.* VIII, 9–12; VIII, 15. Rome's 254 bakeries with possible capacity of 450,000 daily loaves could hardly have fed more. Loane, H. J., *Industry and commerce of the city of Rome,* 231, Baltimore, 1938.

population was actually concentrated in less than 1,000 hectares, as seems likely, the number to the hectare rises to 350 and one understands the need for apartment houses.

For Constantinople there is some information of much the same type as for Rome. The grain evidence may be taken up first. Constantine (306–337) is said to have assigned a daily 80,000 of something to the city which Constantius (337–361) increased by more than 40,000.[25] The choices as to the identity of the something seem to be loaves of bread, *modii* of wheat, and *artubas* of wheat. The two latter have been preferred because it was thought that the city had more than 80,000 or 120,000 persons which the gift of that many loaves would imply. However, different types of bread were actually assigned to particular houses [26] and the term "bread" is frequently the term used to denote the provisioning of places in the decrees.[27] Furthermore, one may apply a check by estimating how much bread or grain the 611 gold pounds given to the city for grain at the end of the fourth century would actually buy.[28] Presumably the gold pound was worth about 432,000*d*.[29] The 611 gold pounds would amount to 263,952,000*d* a year: the amount for a day would be about 723,000*d*. If the allotment was about 3½ *modii* a month [30] (to provide a loaf of bread a day to one person) and a *modius* of wheat cost about 85*d* [31] about 70,000 could be given a loaf a day. However, if the *modius* cost only about 65*d* the number which could be fed would be nearer 100,000. The imperial gift was thus probably of loaves of bread.

With this information may be compared the data about the walls. Constantine enclosed his favorite city with walls including an area of about 640 hectares.[32] This, at 80,000, would give about 125 to the hectare which is what might be expected. Theodosius II about A.D. 447 increased the walled area to about 1,200 hectares which even in the renaissance of the tenth century was not filled.[33] The actual inhabited area has been estimated at about 960 hectares.[34] Two currents were in motion which would naturally affect the population of the city. In the first place, as capital of the East it might be expected to increase: on the other hand the general decline of population might prevent an all-out expansion. St. John Chrysostom suggested a Christian population (late fourth century) of about 100,000,[35] which would fit in with a total of perhaps 50 per cent more. Ausonius in the same period still thought of Rome which was just estimated as about 172,000 at this time as somewhat larger.[36]

The *Notitia* of Constantinople of about A.D. 424–450 says that the city has 6 palaces, 3 most noble houses (*domus nobillissime*), 52 porticoes, 153 baths, 322 *vici*, and 4,388 houses (*domus*).[37] This information is designed to indicate the more salient features of the city rather than to provide an estimate of housing. The *insule* are not given. However, an estimate of population can be made. The houses, if the examples of Pompeii are typical, must have covered at least 1,000 square metres apiece or 438 hectares for them all. This would leave about 520 hectares for the rest of the occupied area of the city. In view of the obvious lack of pressure one can hardly assume more than 200 to the hectare. The estimate then would be:

4,388 houses × 10	43,880
520 hectares × 200	104,000
Total	147,880

This hardly agrees with the estimates of those who would have a population of from one-half a million to a million for the city.[38] By this time it had surpassed Rome more probably because Rome was declining rapidly than because Constantinople was increasing much in the fifth century.[39]

Recently another notice of the same type for the city of Alexandria has been found. The evidence is said to come from about the period of the late fourth–early fifth centuries. However, the total given in the document for the different edifices seems to have no relationship to the numbers given for the five sections of the city. Furthermore, it differs markedly from the detailed figures by showing many more courts, nearly twice as many houses and many more baths. Since

[25] Socrates, *Hist. Eccles.* II, 13; mentioned in Sozomen, III, 7, 7.

[26] *Cod. Theod.* XIV, 17, 12.

[27] *Cod. Theod.* XIV, 17 *passim.*

[28] "Sexcentarum undecim auri librarum quantitas ad coemptionem frumentarum ut perpetua dedicatio." *Cod. Theod.* XIV, 16, 3.

[29] *R. E.* under "denarius," 212.

[30] Stein, E., *Histoire du Bas-Empire* **2**: 842, Paris, 1949.

[31] Andreades, A., De la monnaie et de la puissance d'achat des métaux précieux dans l'empire byzantin, *Byzantion* **1**: 91, 1914; see also maximum price of 100d set by Diocletian, Frank, *ESAR* **5**: 318.

[32] Estimated from Shepherd's *Atlas,* 93; Emereau, C., Constantinople sous Theodóse le Jeune: les régions urbaines, *Byzantion* **2**: 109–122, esp. 120, 1925; the earlier walls had enclosed about 150 hectares. Emereau, C., Notes sur les origins et la formation de Constantinople, *R. Archéol.* **21**: 5 and plan, 1925.

[33] *Camb. Med. Hist.* **4**: 749: Janin, R., *Constantinople byzantin,* Paris, 1950.

[34] Stein, E., *Histoire du Bas-Empire* **2**: 842; *Traditio* **7**: 154, 1949–1951.

[35] Lot, F., *End of the ancient world,* 71. He believed in a small population at Constantinople.

[36] Ausonius, *Ordo urbium nobilium,* written about A.D. 388–389.

[37] *Notitia dignitatum,* ed. Seeck, Berlin, 1876. Quoted in *Camb. Med. Hist.* **4**: 748. See also Emereau, *Byzantion* **2**: 109–122. The data in the *Notitia* may have beeen revised from before the time that the walls of Theodosius II were erected. Two suburbs of the *Notitia* were outside of the walls but enclosed only 598 *domus.* Emereau, 117.

[38] Sozomen, quoted by Bury **1**: 88.

[39] Andréades, A., De la population de Constantinople sous les empereurs byzantins, *Metron* **1** (2): 68–119, 1920; *Camb. Med. Hist.* **4**: 750.

TABLE 67

HOUSING DATA FROM ROMAN ALEXANDRIA

	Temples	Courts	Houses	Baths	Taverns	Porticos
Older list	2,393	8,102	47,790	1,561	935	
New list						
Quarter a	308	1,655	5,058	108	237	112
b	110	1,002	5,990	145	107	—
c	855	955	2,140	—	205	78
d	800	1,120	5,515	118	178	98
e	405	1,420	5,593	—	118	56
Actual total	2,478	6,152	24,296		845	

Source: Frazer, P. M., A Syriac *Notitia Urbis Alexandrinae*, *Jour. Egyptian Archaeology* **37**: 103–107, 1951.

the city had been much larger earlier and had declined from an area of about 920 hectares in the first century A.D. to about 640 in the fourth, the list would seem to be that of the earlier city, perhaps of about the first century. If we assume that the house is really an apartment and the court a fair sized house, an estimate can be made for the population indicated by the two lists. If we multiply the courts by 6 and the apartments by 3.5,[40] we have a population of about 215,877 indicated by the first list and 121,948 by the second. The number to the 920 hectares (assuming it refers to the first century) would be about 235 while that of the second (assuming 640 hectares) would be about 191. It was a relatively crowded city.

There are many inscriptions giving what civic officers paid for admission to their offices, the so-called *summa honoraria* or *summa legitima*.[41] The data may be compared with the number of hectares occupied by the cities themselves (table 68). The data are subject to serious qualifications. The exact size of the Roman city is often difficult to ascertain. Many estimates have been made from indications of Roman occupation in modern maps. Then the cities changed in size during their history. This is probably the reason why the officers of Diana in North Africa paid sums ranging from 2,000 to 6,000 sesterces.[42] In Timgad the sum seems to have changed although from the data given it would appear that about the same amount was paid for several of the higher offices. This seems certain in the case of Cirta. In five cases the number of sesterces to the hectare varies from 100 to 180. This is about the number of persons expected to the hectare.

[40] Based upon the numbers to apartment and court given in Hombert et Préaux, *Recherches sur le recensement dans l'Égypte romaine*, 154–155, Leiden, Brill, 1952. The *Notitia* states that certain outlying areas are not included. It seems probable that they were abandoned at the time of the second list. The 110 *modii* (enough to feed five or six hundred people) added to the free grain in A.D. 436 does not suggest a great city. Krueger, P., ed. *Codex Justinianus* **2**: 435; **11**: 28, Berlin, 1877.

[41] Liebenam, W., *Städteverwaltung in römischen Kaiserreiche*, 54–65, Leipzig, 900: Daremberg-Saglio under "summa honoraria."

[42] Liebenam, *op. cit.*, 58.

TABLE 68

RELATION OF SUMMA HONORARIA TO AREA IN SOME ROMAN CITIES

City	Officer	Summa Honoraria (1,000 sesterces)	Area in hectares	Average to hectare
Pompeii	Duumvir	10	66	152
Carthage	Quinquennalis	38	288	132
Rusicade	Aedilis	20	210?	95
Cirta	Aedilis	20	36+	
Cirta	Triumvir	20		
Cirta	Quinquennalis	20		
Cirta	Decurio	20		
Cirta	Praefectus IV Coloniarum	20		
Hippo Regis	Duumvir	10	100	100
Bulla Regis	Duumvir	5	45	111
Cuicul	Duumvir	4	14+	
Theveste	Aedilis	4	9+	
Timgad	Duumvir	4	50	80
Timgad	Aedilis	3	50	60
Muzuc	Decurio	1.6	40	40

Source: Pompeii, Frank, *ESAR* **5**: 105; Carthage to Muzuc, see table 79.

Timgad and Muzuc would seem to have less, but this is expected of smaller places. Cirta's mesa measured only about 36 hectares, but the city was certainly larger. At Lambaesis, although the Byzantine walls enclose only nine hectares, the area of the city must have been considerably larger. The area at Cuicul may also have been larger than this estimate.

When one turns to the priesthoods (table 69), the matter is not so easy. For the *flamonium perpetuum* the sum was 82,000 at Rusicade, just about four times the 20,000 for the aedileship. At Thubursicum Numidarum the same offices brought 6,000 and 4,000: one wonders whether the first number might not be 16,000. If we divide the amount for this office by 4, the results may be seen in the table: the relationship to the hectares then is much like that for the *summa honoraria*. To

TABLE 69

RELATION OF HONORARIA FOR PRIESTHOOD TO AREA

City	Summa in sesterces	Divided by 4	Hectares
Thougga	50,000	12,500	49
Lambaesis	12,000	3,000	30–115
Uchi Maius	12,000	3,000	20
Capsa	10,000	2,500	28
Thuburbo Maius	10,000	2,500	32
Numlili	4,000	1,000	80
Ostia	50,000	12,500	72
Pisa	50,000	12,500	40
Assisi	2,000	500	10

Sources: African cities, see table 79; Ostia, Carrington, *Pompei*, 24 gives 70 hectares; map in *Enci. Ital.*, sevirate, Frank, *ESAR* **5**: 246; Pisa, Frank, *ESAR* **5**: 105; map in R. E.; Assisi, Frank, *ESAR* **5**: 105.

these are added three cases for the sevirate in Italy, and one case for an uncertain office at Thougga.

This survey of evidence about the density and size of city population in the Roman Empire does not confirm the high estimates made by ancient and modern writers about those cities. The highest density was probably in Augustan Rome but even there it was probably not over 350 to the hectare and by the fourth century had dropped to below 200. Alexandria, even in a constricted position, still had but few more than 200, while Constantinople probably never had more than 150 to the hectare. Thus it would seem that large cities or perhaps any cities crowded by environment might have 200 to the hectare. Medium-sized cities, well populated and prosperous, would fall below this according to circumstances and range between 100 to 150. The smaller places, particularly if surrounded by walls built in anticipation of later growth, might have a quite low density.[43] The cities of Gaul and of England would seem good examples of this. Roman life was, after all, a life in which much time was spent in the open and this requires space.

3. PATTERNS OF CITIES WITHIN COUNTRIES

Of recent years interest has been taken in the relations of different sized city units.[44] A study of German cities indicates at least in South Germany a consistent pattern of cities with relationship to distance from each other, and to the population of the districts which they serve.[45] The cities would appear to have a mathematical relationship to their function within the population. In theory the distribution might be expected to be even more regular in pre-industrial revolutionary days since today the cities function not merely to service population for simple economic needs,[46] but are often situated to meet more complicated needs of modern industry.

There are cases where the economic functions of a city cause it to grow beyond what its demographic relation to even a large area would seem to suggest. One case of this may be Alexandria in the ancient world: perhaps Antioch is another. Toward the end of the Middle Ages there seem to be more cases. Of this Constantinople is a notable example which at its fall certainly had a small hinterland. The concentration of small industries in Mohammedan cities creates another problem: Palermo, for instance, seems much larger than it should have been as metropolis for Sicily. The textile cities of the Low Countries also have rather large populations, comparatively speaking. Nevertheless, even making these exceptions most of the cities which can claim to be metropolitan centers of wide areas must have owed their size to their political, social, and economic functions within the area. To these in many cases in the Middle Ages will be added their function as a leading ecclesiastical city.

TABLE 70

RATIO OF POPULATION OF METROPOLITAN CITY TO POPULATION OF COUNTRY

Area and date	Size	Population	Capital	Size	Per cent
Naples 1278		2,000,000	Naples	25–30,000	1.3–5
England, 1377	143,000	2,225,000	London	36,000	1.62
Iberia, 1587	590,000	7,600,000	Seville	120,519	1.59

Sources: Naples, Beloch, *BI* **1**: 170–172, 203; England, Russell, *BMP*, 142, 146; Iberia, see tables 55 and 124.

The relationship of the metropolitan city to its territory may be estimated in a few instances (table 70). Naples, for the sixteenth century, had increased to a population of about 212,000 in a population of 2,100,000 and thus had nearly 10 per cent. There is, even in the thirteenth century, the problem of Palermo which may have been larger than Naples, but which can be considered part of another area. Iberia of 1587 includes Portugal as well as Spain: both were under Philip II. If Wales and parts of Ireland are added to England in 1377 London would be almost exactly 1½ per cent of the total population. In 1086 it would seem that London was 1½ per cent of the English population but by the middle of the sixteenth century it had increased much past that point. In general it appears that about the end of the Middle Ages the change in demographic conditions increased the relative size of cities to the total population.

A problem here is France of 1328 of which Paris, the capital, had only about ½ per cent instead of 1½ per cent. Paris, assuming that it had about 21,000 hearths, would have had the proper per cent of population for a great block of French territory extending as far south as Poitou, east to Burgundy and west to Brittany.[47] This had a unity of its own, the territory of the *langue d'oïl*, of "France," entered at Orleans and extending to Beauvais.[48] Similarly, Toulouse in the south, if it had about 11,000 hearths, would have

[43] Wycherly, R. E., *How the Greeks built cities*, 13–14, 26–27, London, Macmillan, 1949.

[44] For instance, Singer, H. W., The "courbe des populations." A parallel to Pareto's Law, *Economic Jour.* **46**: 254–263, 1936, and literature cited on 258 and 263: Lotka, A. J., *Science*, 164, 1941.

[45] E. Ullman, A theory of location of cities, *Amer. Jour. Sociology* **46**: 853–864, 1941; Christaller, W., *Die zentralen Orte in Suddeutschland*, Jena, 1935; also a paper in *Comptes rendus au Congrès Internationale de Géographie*, Amsterdam, 1938, **2**: 123–137.

[46] Padovan, C., Influenza della grande città antica sulle popolazioni rurali, *Proceedings*, Rome **1**: 489–517.

[47] See table 105. Numbers following each name indicate hundreds of hearths: Vicomté de Paris 117, Caux 42, Vitry 56, Bourges 120, Amiens 116, Chaumont 49, Gisors 62, Troyes 35, Cotentin 64, Anjou 55, Maine 55, Touraine 74, Rouen 60, Senlis 65, Meaux 34, Caen 51, Vermandois 131, Sens 153. To these minor fiefs might be added and perhaps even Saintonge 73 and Poitou 116, although these would raise the total to 1,528,000 hearths, requiring for 1½% a city of 23,000 hearths.

[48] *Camb. Med. Hist.* **6**: 330.

TABLE 71

SIZE OF SEVEN LARGEST ENGLISH CITIES, 1086 AND 1377

Rank	1086		1377	
	City	Population (in 1,000's)	City	Population (in 1,000's)
1	London	17.8	London	35.
2	Winchester	6.	York	10.8
3	Norwich	4.4	Bristol	9.5
4	York	4.1	Plymouth	7.2
5	Lincoln	3.6	Coventry	7.2
6	Thetford	2.6	Norwich	5.9
7	Bristol	2.3	Lincoln	5.4
Total		40.8		81.0

Source: Russell, *BMP*, 50–51 and 142.

had about 1½ per cent of the population of a large part of the Languedoc.[49] This would, of course, leave certain areas presumably dependent upon Bordeaux in the west and upon Strasbourg, Lyons, and possibly Genoa in the east. If this is an accurate pattern of metropolitan status and dependent areas, it shows a France still strongly local in the fourteenth century and quite slow in its urbanization.

It is unfortunate that more examples are not available which would give as clear evidence of relationship as the three given above. Yet using 1½ per cent as an index one finds that a surprising number of instances would seem to conform, as far as the paucity or lack of definiteness would permit. This index then has been used extensively as one means of estimating population. Its limitations should be kept carefully in mind. In the first place it is a very small percentage of the total and, therefore, the total based on it could vary widely as a result of a slight difference in the percentage. In the second place many of the estimates based upon the apparent size of cities are quite tentative in regard to both actual area and the density of population. Our faith in its value is largely a faith in the tendency of society to form definite patterns of association and settlement as it forms definite patterns of most phases of its culture. In many cases one is dealing with a culture based on cities as centers—the Mediterranean pattern. One may have to make exceptions for areas which, for instance, like the Celtic culture, are not based upon the city.

The problem of the relationship of provincial and other local centers is naturally more complicated. For one thing it is often more difficult to define the area dependent upon the center. Then since its population is smaller, local industries and conditions can affect its population more easily. The relationship of cities and villages has been approached from the standpoint of order and mathematical theory.[50] One interesting suggestion is the formula:[51]

$$n_r = \frac{C}{r}$$

n_r is the population of city n
r rank of city among cities of country
C a constant

Now since the rank of the top city is 1, the constant in each case would be the population of the largest city and so on for the others. The formula does not quite hold for England of 1377 but modified slightly it seems reasonably close.

$$n_r = \frac{C \times \left(1 + \frac{\sqrt{n-1}}{10}\right)}{r}$$

In another approach to size of villages their number broken into classes based upon 25 multiplied by geometrical progression conforms to the curve of chance.[52]

The base upon which population estimates can be made can be broadened from that of the largest city by using the formula for the next cities in size and by an average of several of them. The approach can also be made by an accumulative procedure. If, for instance, the largest city should have about 1.47 per cent of the population, the first seven should have the percentage of that city plus that of the next six cities (6/7 of 3.32) or 1.47 + 2.83 which would be 4.30 per cent. However, it is often difficult to secure information about all of the first seven cities. In these cir-

TABLE 72

THEORETICAL DISTRIBUTION OF ENGLISH SETTLEMENTS

Rank of settlements by population	Area of each district (sq. km.)	Percentage of population of country of settlements ranked from 1 through group considered
1 (London)	125,000	1.47
2–7 (See table 71)	17,857	3.32
8–49	2,550	7.95
50–343	366	18.5
344–2,401	52	43.
2,402–	7.5	100.

The total area of England is 125,000 square kilometers. The other areas are secured by dividing this 125,000 by the largest number in each rank, that is, 7, 49, 343, etc.

The hypothetical population of the third column is a cumulative total.

[49] Including Rouerge 53, Gascony 90, Limosin 25, Bigorre 12, Périgord and Cahors 131, Carcassonne 84, Toulouse 154, Beaucaire and Nimes 102, a total of about 651,000 hearths.

[50] Rashevsky, N., *Mathematical theory of human relations*, 89 ff., Bloomington, Ind., Principia Press, 1947.

[51] Quoted by Rashevsky (as above) from Zipf, G. K., *National unity and disunity*, 93, Bloomington, Ind., Principia Press, 1941.

[52] Russell, *BMP*, 306–312.

TABLE 73

PATTERN OF SIZE OF CITIES, ROMAN

Site	Units	1	2	3	4	5	6	7	Source, table
Hypothetical	Per cent	100	57	39	30	24	20	18	
Iberia, I	Hectares	384	140	101	50	47	45		76
Iberia, II	Hectares	180	81	80	47	45	40	40	76
North Africa	Population (1,000's)	38	20	20	20	16	12	10	79
Greece	Population (1,000's)	50	28						80
Balkans	Hectares	234	180	95	70	—	24		80
Egypt	Population (1,000's)	110	—	—	35	34	24	20	81
Asia Minor	Population (1,000's)	90	51	34	24	24	23	18	83
Syria	Population (1,000's)	90	37	31	30	20	20	13	86
Gaul, I	Hectares	100	50	40	32	20	16	14	87
Gaul, II	Hectares	113	40	36	34	30	26	19	88
Gaul, III	Hecatres	285	120	97	70	69	65	50	89
Britain	Hectares	134	97	81	69	56	44	42	90

cumstances the formula offers the easiest approach. We should emphasize the tentativeness of the formula which is offered. It is probable that a more accurate one can be devised.

Actually, the pattern of village size in England does not follow the pattern in the bottom three groups. There would seem to be, for instance, in the samples given,[53] about 20 per cent of the villages having from 0 to 50, 60 per cent from 50 to 200, and again 20 per cent from 200 to 800 people. While these are interesting from the standpoint of theory, they involve information about numbers of villages which usually are not available. However, the comparison of the data from England of 1086 and 1377 would show that some of the relationships were not disturbed merely by increase in total population of the country although that might have been expected. It would seem then that, if the numbers of population of cities or even comparable measurements, like areas, fall into the pattern of top cities, this may be used to make an estimate of total population.

[53] *Ibid.*, 306–312.

The formula for rank and population of cities within an area which has a natural unity was given above as

$$n_r = \frac{C \times \left(1 + \frac{\sqrt{r} - 1}{10}\right)}{r}.$$

If the population of the largest city (number 1) is represented as 100, the population of the second should be 57, the third 39, the fourth 30, and so on (first line of table 73 and 74). In those tables is given the population (in 1,000's) or the number of hectares in area of the larger cities of several late Roman and medieval geographical areas which seem to have a natural unity.

The evidence about the size of cities, especially of the Roman Empire (table 73) is limited in value by the meager or uncertain information known of some of the cities. The picture would be accurate only if the political and economic life of the area was very stable: any marked changes in this life would force a reshaping of the pattern. Of this probably the best illustration is the establishment of Constantinople as the capital of the eastern half of the empire. It supplanted the great

TABLE 74

PATTERN OF SIZE OF CITIES, MEDIEVAL

Site	Units	1	2	3	4	5	6	7	Source, table
Hypothetical	Per cent	100	57	39	30	24	20	18	
Iberia, Moor.	Population (1,000's)	90	52	31	29	28	25	23	93
Russia	Hectares	400	200	60					P. 100
Syria, Crusade	Hectares	325	192	120	112	80	80	56	100
France, South	Hectares	289	250	200	151	—	65	57	87
France, North	Hectares	439	175	150	140	135	115	104	88
Seljuk	Population (1,000's)	40	25						P. 100
Germany, West	Population (1,000's)	30	20	10	9	7	7	6	142
Germany, Center	Population (1,000's)	23	18	11	10	10	9	7	142
Germany, East	Population (1,000's)	30	25	14	10	9	8	8	142
Germany, North	Population (1,000's)	22	18	18	18	12	8	5	142
England, 1086	Population (1,000's)	17.8	6.0	4.4	4.1	3.6	2.6	2.3	71
England, 1377	Population (1,000's)	35	11	10	7	7	6	5	71

Source: for England, Russell, *BMP*, 50–51, 142.

cities of Asia Minor as the largest city of the area. Such a change would disturb the pattern and set up a new one. As an hypothesis the pattern offers a method of estimating population for many areas where no other method seems to offer a chance.

It can be seen that in general there is evidence of some relationship between the areas of cities and the pattern presented above. It may be said that the research and recording of the information about the areas of the cities had been largely accomplished before the idea of this particular pattern was discovered. In this respect it is hoped that the system did not produce a bias in favor of certain numbers of areas. It should be remembered that many of the estimates of areas of ancient cities lack much in accuracy. The estimates were taken where they could be found. Here, as in so many places in the study, there will be room for much further research.

The data of the types presented in this chapter vary more widely in accuracy than those of the preceding chapter and rest more upon the inherent accuracy of the particular case. If the inhabited area is known quite accurately and the condition of the city economically also is well understood, the population estimate should be within 20 per cent of the correct number. The estimate of total population of a large area based upon the size of the cities is subject to wider variation of accuracy, at least until further research has made the principles clearer. However, they do offer methods of approximation which are of value to check existing approximations and to give a rough estimate in cases where no other approach is available. These are of considerable value in dealing with the highly urbanized later Roman Empire.

VII. IMPERIAL DECLINE TO A.D. 543.

Any study of the population of the Roman Empire should begin with the data which Beloch presented in his fine study, *Bevölkerung der griechische—römischen Welt*. To that fund of information may be added some information which has been discovered since his work appeared. In addition the areas of cities and the relationship of cities to the total population of the countries depending upon them will be used to estimate population according to the methods described in the last chapter. These methods tend to corroborate Beloch's estimates for great areas although they reduce even further the credibility of the large round estimates written by classical writers. The evidence will be considered by geographical divisions: western Mediterranean, eastern Mediterranean, northwestern Europe, and eastern Europe. The study will have to test the common opinion that population in the empire was declining after the second century.[1]

The problem of the metropolitan centers of the period are many. Rome was the center, not merely of Italy but also of the western half of the empire economically and politically. Cadiz in the early part of the period was the metropolis for the southern half of Spain and a good part of the North African shore: this supremacy was apparently lost as the period passed, the southern part to Carthage and the northern to mainland Spain centers, notably Córdoba. North of Cadiz, Cartagena and Tarragona apparently shared the leadership. Slowly recovering from the awful destruction of the second century B.C., Carthage gradually won back the first position in North Africa. Narbonne was probably the great city of Mediterranean Gaul at the start but lost to Toulouse as the Visigoths selected it as a capital. In the east Alexandria, Antioch, and Smyrna stand out before Constantinople eclipsed the others of the Aegean area, while Ankara (Ancyra) was apparently the metropolis for the central part of Asia Minor. In Gaul, Trèves and Lyons were the original leaders but Paris grew at the end of the period. London, as always, was the metropolis of the British Isles. For central and eastern Europe the tribal organization makes it difficult to pick urban centers of importance.

1. WESTERN MEDITERRANEAN

ITALY

At first sight the problem of Italy seems easy because the census of Roman citizens applied largely to it. However, both the proportion of population which lived in Italy and the proportion of total population represented in the census are subject to a wide variety of interpretations. For instance, Frank believed that the population of Italy approached twenty million whereas Beloch thought that it was a little over seven if the islands were included.[2] The population of Rome seems to be within estimation with some certainty, but here the question of the relationship of Rome to Italy is a difficulty. Unquestionably, its function as head of the empire or, economically, as head of the western half of the empire would produce a far greater population than its headship in Italy. Under these circumstances it seems best to try a third approach by comparing the size of Italian cities of the first rank at periods when they seem of about equal size, assuming that the total population during the two periods also will be about equal.

The cities of medieval Italy were outgrowing their Roman walls in the period 1150–1250 and thus the total population of the medieval period might be thought

[1] "Sed tunc erat amplior multitudo; et plures militiam sequebantur armatam," Vegetius to Valentinian (I, v) quoted by Secrétan, H-F, *La population et les mœurs*, 43, Paris, 1916. His chapter on depopulation (11–117) is excellent. For a comprehensive and recent summary indicating a general depopulation see Boak, A. E. R., *Manpower shortage and the fall of the Roman Empire in the west*, 3–21, Ann Arbor, Univ. of Michigan Press, 1955.

[2] Frank, *ESAR* 5: 140 n. 3, 182; Beloch, *BGRW*, 435–443, 507.

TABLE 75

COMPARATIVE POPULATION—ROMAN AND EARLY THIRTEENTH-CENTURY ITALY

Place	Hectares		Population estimate		Regional estimates	
	Roman	13th cent.	Roman	13th cent.	Roman	13th cent.
Sicily					[600,000]	600,000
Palermo	200	200		50,000		
Catania	120		[18,000]			
Messina				26–27,000		
Southern Italy					[2,500,000]	2,000,000
Naples	103	103	[15,000]	25–30,000		
Capua	180		[36,000]			
Papal States					[2,000,000]	2,000,000
Tuscany					[730,000]	730,000
Pisa		114	20,000	15,000		
Florence	32	105		20,000		
Northern Italy					1,600,000	2,441,540
Bologna	50	419.5	10,000	42,000		
Milan	113	314		52,000		
Aquileia	84					
Venice		324				
Padua	145	100				
Genoa						
Total					7,430,000	7,771,540

	Population	Communities (Strabo)
Southern and Central Italy	5,230,000	350
Northern Italy	1,600,000	80

Sources: Palermo, Beloch, *BI* **1**: 95, 119.
Catania, map from *EUI*.
Messina, Beloch *BI* **1**: 136. That is, two-thirds of Palermo.
Naples, Beloch, *BI* **1**: 169–170.
Capua, Beloch, *BGRW*, 487; J. Henryen, *Recherches. Capoue preromaine*, Paris, 1942; Carrington, *Pompei*, 24.
Pisa, Beloch, *BL* **2**: 161. The thirteenth-century city was larger than the Roman in area and possibly in population.
Florence, Beloch, *BI* **2**: 127, 129.
Bologna, Beloch, *BI* **2**: 91; *BGRW*, 487.
Milan, Beloch, *BGRW*, 487.
Aquileia, Calderini, A., *Aquileia Romana*, xcviii, 336–338, Milan, 1930, Pubblicazioni della U. Cattolica del Sacre Cuore, Soc. Sci., **10**. He refuses to guess at population (336–338) but says that settlement extended well beyond the walls (xcviii). Kenner, *Fundkarte*, 7, fixes walled area at 72.59 hectares.
Padua, Gasparotto, C., Patavium municipio Romano, *Archivio Veneto*, 5th ser. **2**: 11, 97 (map), 102, 1927; *Enci. Ital.*; Strabo (II, v, 1) said second in size in Italy.
For other Italian cities Beloch, *BGRW*, 487 gives: Caere 117, Ardea 85, Pompei 64.7, Torino 47, Aug. Pret. Salassi 41.4, Norba 34.5, Rimini 34, Alba Fucentia 33.5, Praeneste 32, Falerii 29, Florence 22, Sorrento 22, Pola 16.5, Segni 16, Tusculum 15, Cora 13.5.

to be about equal to the Roman population of Italy at that time. The estimate used for comparison (table 73) is for the time 1250–1300 when Italian population had increased over the previous century: it is estimated at about 8.4 million. In table 75 the size and population of the larger cities and of the several divisions are estimated. Rome is omitted because at least a part of its great size was the result of its function as head of the empire. There was an obvious shift in population toward the north in the intervening centuries. Another bit of information, unfortunately highly distrusted,[3] would tend to show a similar situation in classical Italy and in the Middle Ages. Pliny said that Picenum in 299 B.C. when densely populated saw 360,000 persons take the oath to Rome.[4] The Mark of Ancona, apparently the medieval equivalent, had about 90,300 hearths which at 3.5 to the hearth gives 316,000.[5]

Now the last census, taken by Claudius in A.D. 48, recorded 5,984,072 persons.[6] If the *cives* so included are both men and women above the age of seventeen, another third must be added to estimate their children,[7] raising the number to 7,998,024. If about one-fifth are subtracted because they lived outside of Italy,[8] the

[3] By Beloch, Die Bevölkerung Italiens im Altertum, *Klio* **3**: 472, 1903.

[4] Pliny, *Nat. Hist.* III, 110.

[5] Beloch, *BI* **2**: 74.

[6] Tacitus, *Ann.* XI, 25, 5. For other statements about the returns of this census, usually about a million larger, see Beloch, *BGRW*, 371.

[7] Using the life table for Aemilia, etc., that is, table 27.

[8] With Frank, *Classical Philology* **19**: 340, 1924.

citizen population of the peninsula should be about 6,500,000. The slaves and aliens would probably raise the estimate to about 7 million.[9] Of course, if one commences with other assumptions, other results occur. If, for instance, the *cives* are assumed to be male, the population estimate would be doubled.[10] However, the comparison with the cities of thirteenth-century Italy would make the smaller estimate more acceptable since they corroborate each other.

In the preceding chapter the population of Rome was estimated at 350,000 at the time of Augustus, about 241,000 at the beginning of the third century, and 172,600 in the middle of the fourth century. The Augustan total would suggest Rome as the metropolis for an area containing at 1½ per cent some 23 million people: a number which would encompass the western half of the empire with Gaul, that is the part of the empire contiguous to the Mediterranean in the west. The estimate of 8 million for Italy and its islands would thus fit well into the hypothesis that Rome was the metropolis of the western half of the empire.

Between the census of houses in the fourth century and the next bit of information which may be used to estimate population of the city of Rome much happened to damage the city. The Visigoths sacked the city in 410 and the Vandals repeated the action in 455. For the most part the emperors chose to live at Ravenna rather than at Rome. Then the western half of the Empire fell apart, leaving Rome as merely one large city in a politically separate Italy. The real source of strength in the city was the Papacy except during the time of Theodoric. Under these circumstances the city probably declined markedly in numbers. Theodoric apparently gave 120,000 *modii* of grain to the Roman people in A.D. 500.[10a] This would feed only 12,000 persons a year and that very meagerly.[11] The size of the area inhabited within the city of Rome still suggests that the total was three or four times 12,000. An effort has been made to show that the pork rations were issued to about 317,333 in A.D. 367; about 120,000 in A.D. 419; and 141,120 in A.D. 452.[12] If, as we believe, Rome of about A.D. 367 had only about 173,000, half of the estimate based on pork, the proportionate figures for 419 and 452 should be about 58,000 and 65,000.

If the population of Italy followed the decline of Rome, it should have been below 4 million in the middle of the fourth century. An imperial document of 395 acknowledged that more than a half-million *iugera* (about 132,000 hectares) of rich Campania were deserted and untaxable.[13] A few years later St. Ambrose wrote of Bologna, Modena, Reggio and other places in Aemilia as "corpses of half-ruined cities" while a century later Pope Gelasius (492–496) called Aemilia and Tuscany almost uninhabited.[14] If Rome had a population of about 36,000–48,000 about A.D. 500, it could have been the metropolis for a state of about 2.4–3.2 million, but by then it had ceased to be an effective metropolis as Ravenna and Pavia became political centres. The decline of Italian population can be seen in the smaller area of walls, particularly in the sixth century.[15] The earlier wall of Florence had enclosed about thirteen hectares: the new one included only nine.[16] The difference probably overemphasizes the extent of the decline since many persons must have fled the older cities to build the new hill towns. Italy may well have had less than 4 million at the end of the period.

IBERIA

Iberia is a great peninsula, about 590,000 sq. km. in extent. Its geographical features tend to divide rather than unite the area and until the Visigoths united it near the end of the period it had not experienced any really unifying regime: Hither and Farther Spain were separate political units. Under these circumstances it is not surprising that it had two rather than one metropolitan center in the Roman period. For the river valleys of the southwest in which Farther Spain and Lusitania lay Cadiz was first the metropolis, perhaps losing to Toledo in the later Roman period. Hither Spain had Tarragona as its center. The problem is complicated by the dependence of a part of the North African territory upon Cadiz in the early period. Fortunately, there is quite direct population evidence about a part of the country.

Probably there were two metropolitan cities in Iberia,

[9] This estimate fits well with the guess by John Morris that the 4,100,900 given in a fragment of the *Fasti Ostienses* (*Année Épigraphique*, 169, 1946) is "an incomplete total before overseas results had come in and thus gives the citizen population of Italy." Jones, A. H. M., Ancient economic history, an inaugural lecture delivered at University College, London, 7, London, 1948. Since the total of the census of A.D. 14 was 4,937,000 it would appear that about a fifth was missing.

[10] Frank, as above and *ESAR* **5**: 1,140 n. 3,182. The number of communities in central and southern Italy was 350 and in the north 82. Beloch, *BGRW*, 339.

[10a] *Anonimus Valesianus*, 12, 67 (Loeb trans. with Ammianus Marcellinus **3**). The date is given by Cassiodorus, *Chronica Minora* **2**: 160, *Mon. Germ. Hist.*

[11] Chastagnol, A., Le ravitaillement de Rome en viande au Ve siècle, R. H. **210**: 13–22, esp. 18–19, 1953.

[12] Mazzarino, S., *Aspetti sociali del quarto secolo*, 223–231, Roma, 1951. He believed that Rome had a population of a million then.

[13] Actually 528,042 *iugera*. *Cod. Theod.* XI, 28, 2, quoted by Salvioli, G., Sullo stato e la popolazione d'Italia prima e dopo le invasione barbariche, *Atti della R. Accademia*, Palermo, ser. 3, **5**: 1–70, 1899.

[14] Hodgson, F. C., *Early history of Venice* **1**: 18, London, 1901 and sources there cited.

[15] Maetzke, G., Ricerche sulla topografia fiorentina nel periodo delle guerre Goto-bizantine, *Rend. della Accademia Naz. dei Lincei*, Cl. di scienze morale, st. fil. anno 345, **3**: 98, 1948. Mengozzi, G., *La città italiana nell'alto medio evo*, Florence, 1931.

[16] Maetzke, 109 with plan showing both walls. The decline in receipts from about A.D. 450 to about A.D. 533–536 from Lucania-Brutium was from 6,400 to 1,200–1,000. Chastagnol, *R. H.* **210**: 19, 1953.

TABLE 76

ROMAN IBERIAN CITIES

City	Area in hectares	Population estimate (1,000's)	Judicial districts under city
Cadiz	384	65	
Córdoba	140	20	
Mérida	101 or 84	15	
Hispalis	50	8	
Carmona	47	8	
Malaga	45	7	
Tarragona	180	27	42
Cartagena	81	10	65
Pamplona	80	10	
Zaragossa	47	6	55
Salamanca	45	6	
Clunia Sulpicia			69
Ecija (Astigi)			49
Braga			24
Astorga	40	5	22
Leon	40	5	
Sagunto	40	5	
Lugo	25	3	15
Valencia	9		

Sources: unless otherwise given the estimates are made from modern maps in the National Library of Wales, Aberystwyth.
Cadiz, estimate from Pliny, IV, 119 in *R.E.*, 447; larger estimate because population spread to mainland.
Mérida, *R.E.* quoting Hyginus, De limit. constit, I, 170 (400 iugera); but see Farres, O. G., Cual fué la extensión urban de la Mérida romana? *Arch. esp. arqueol.* **19**: 361–363, 1946.
Hispalis, estimate from *R.E.*
Carmona, B. T., Las murallas romanas de Carmona, *Arch. esp. arqueol.* **25**: 348–351, 1952.
Cartagena, Beltran, A., Topografía de Carthago Nova, *Arch. esp. arqueol.* **21**: 191–224, 1948; map, *ibid.* 195; El plano arqueológico de Cartagena, *ibid.* **25**: 47–82, 1952. These assume no settlement on the island.
Pamplona, map from *EUI*.
Astorga, map from Baedeker, *Spain and Portugal*, 151, 1913.
Sagunto, map in *EUI*.
Lugo, Roman wall has circumference of 2,131 metres.
Valencia, map in Ayuntamiento in Valencia.

the centers of the two Roman provinces. The population of these cities based admittedly upon evidence somewhat less than satisfactory was about eighty thousand. At the theoretical figure of 1½ per cent of the total population of their districts, they should be centers for some more than 6 million people. About 19 B.C. Cadiz was described as inferior only to Rome in size with five hundred of its citizens listed as knights (*equites*).[17] Cadiz, on account of its geographical location, might have been the metropolis for part of the sparse population on the opposite shore of Africa. It had at the time a great overseas trade.[18] Tarragona was the administrative and road center for its province. Toward the end of the period Cadiz seems to have declined. Toledo was selected as the capital by the Visigoths and had become even before a great ecclesiastical center.[19]

Information of another type about the three northwest judicial districts (*conventa*) is offered by Pliny[20] and thus has been long known. He states that these districts had 691,000 freemen (*capita libera*). The problem is to use this information in an estimate for all of Iberia. In table 77 we assume that the number of cities listed in Menendez Pidal's *Historia de España*[21] offers a reasonable basis for comparing population of the several parts of Iberia. The number is 114 divided as in the table. Here also it is assumed that the *capita libera* include both men and women and thus about two-thirds of the total. This gives a total of 5.3 million to which slaves and aliens together with the unrecorded would bring it to near 6 million.

Beloch, it will be recalled, set the population of Roman Spain at about 6 million.[22] In general, since his estimates are usually regarded as minima, the tendency has been to raise them, in this case as high as 9 or 12 million in the Roman Empire's later days.[23] If we accept the evidence of Pliny which is of the second half of the first century A.D. there must probably be some additions for slaves, but probably not enough to raise the total above 6 million. It is rather difficult to believe in much increase since Orosius in the early fifth century complained that there was already a heavy decline from earlier days:[24]

Throughout the various provinces there exist poor and insignificant settlements situated in the ruins of great cities

TABLE 77

POPULATION ESTIMATE FOR ROMAN IBERIA

Area	Number of cities	Ratio	Capita libera	Population estimate	Political divisions
Three N.W. conventa	22	1.0	691,000	1,036,500	472
Rest of Hispania Citerior	45	2.05	(1,416,550)	2,124,805	
Lusitania	7	.36	251,524	377,286	45
Baetica	39	1.77	1,223,070	1,834,605	175
Total	114	5.18	3,582,144	5,373,196	692

[17] Strabo, quoted in Frank, *ESAR* **3**: 148 and additional material about Cadiz there.

[18] Gagé, J., Gadès, l'Inde et les navigations atlantiques dans l'antiquité, *R. H.* **205**: 189–216, 1951.

[19] See also articles in *R.E.* on Gades and Tarraco.

[20] *Hist. Nat.*, III, 23–28.

[21] The political organizations of the parts of Iberia are so diverse that it is hard to equate them for number. The following is the breakdown (Jones, A. H. M., *The cities of the eastern Roman provinces*, 495, Oxford, 1937). Lusitania 45 *populi* (*Hist. Nat.*, IV, 117); Baetica: 9 colonies, 10 municipia, 27 Latin right, 6 free, 3 federate, 120 stipendiary (*Hist. Nat.* III, 7); Hispania Citerior: civitates 293, oppida 179 (*Hist. Nat.*, III, 18.)

[22] Beloch, *BGRW*, 501–507.

[23] Menendez Pidal, *Historia de España* **2**: 317–318; Frank, *ESAR* **3**: 148. The latter suggests a doubling of Spanish population from the close of Caesar's career to the principate of Hadrian.

[24] Orosius, *Seven books of history against the pagans*, trans. I. W. Raymond, 352, New York, 1936.

TABLE 78

POPULATION ESTIMATE FOR ROMAN NORTH AFRICA

Area	Imperial Estates		Total *iugera* (millions)	Total Sq. km. (1,000's)	Population estimate	
	Cultivated *iugera*	Uncultivated *iugera*			II	*Ca.* 422
					(1,000's)	
Africa	1,800,541	1,140,144.5	15	36.8	750	290.2
Byzacena	1,492,180	1,523,003.5	21	53	510	25
Numidia			27.8	70	695	347.5
Mauretania			60.5	240	1,828	914
Total					3,783	1,806.7
Tripolitana					100	50
10 per cent for non-rural cities					388	185
Total					4,271	2,041.7

which still bear evidence of their names and tokens of their misfortunes. Our own city, Tarraco in Spain, is one of these.

The invasion of the Germanic tribes into Spain is alleged to have brought nearly 2 million persons into the peninsula.[25] The theory is that the German warriors alone numbered about a quarter of a million and that these were but an eighth of the tribes. This would appear to be much too many. It is generally believed that the 80,000 assigned to the Vandals when they crossed from Spain to Africa is a real number based upon an exact count.[26] The Visigoths [27] and others are very unlikely to have been more than four or five times as numerous as the Vandals and thus they probably were not more than three or four hundred thousand. They doubtless merely substituted for the usual loss of population caused by the invasions. The specific statement of Orosius indicates some loss, probably heavy, and quite comparable to that of Italy and North Africa. Thus at the end of the period it was probably down to 3 or 4 million.

NORTH AFRICA

North Africa, with approximately 400,000 square kilometres, was about two-thirds the size of Spain which it resembled in many ways. The evidence about it comes at the height of its development at the end of the second century and later. The best evidence probably comes from the size of cities and their relationship to the total population of the area. Fortunately the evidence from the *summa legitima* or *summa honoraria* is plentiful and seems to correlate with the size of the areas of the cities in the instances known.[28] There is also some information about cultivated and uncultivated acreage which may be considered with respect to the other evidence. The total number of political divisions was 516 *populi* according to Pliny: [29] 6 colonies, 15 towns of Roman citizens, 1 Latin, 1 stipendiary, 30 free cities, and 463 *civitates* (tribal communities).

As long as Cadiz remained a powerful city she was probably the metropolis of a part of the coast of Mauretania (over half of the North African coast). Thus Carthage would be the metropolis for the province of Africa, Byzacena, Numidia, and a part of Mauretania. At 1½ per cent of the total, its population should be representative of about 2½ million people. The other cities, although numerous, seem to fall off in population about as they do for other Roman areas. Elsewhere, it has been shown that for first class grain land 20 *iugera* were thought sufficient to support a *caput* or be a *iugum* in Syria in the fourth century while 2 *iuga* usually represented a family. It is doubtful whether taken as a whole, the province of Africa could be rated as second class grainland (at 40 *iugera* to the *iugum*) and its olive lands would be at about 46 *iugera* to the *iugum*. Thus the province of Africa may be divided by 80 *iugera* to get the average for a family of four. Putting it another way, each person represents about 20 *iugera*. For Byzacena and Numidia the acreage would be twice probably and for Mauretania four times as much.

Now data from A.D. 422 come from an imperial rescript which says that the total area of the estates of the emperor is divided as above for the provinces of Africa and Byzacena.[30] It is assumed that in the second century all of the land of the two areas would have been cultivated either as wheat land or for such crops as figs or olives. Thus an estimate of total population can be made assuming the density of population given earlier.[31] It is assumed that the same proportion of

[25] Pérez Pujol, E., *Historia de las instituciones sociales de la España Goda* **4**: 313, Valencia, 1896. The discussion of population is on 308–315.

[26] See p. 77.

[27] Recently estimated as entering the empire with 70,000 by E. Gautier, quoted by R. Latouche, Aspect démographique de la crise des grandes invasions, *Population* **2**: 686, 1947.

[28] See p. 67.

[29] Pliny, *Nat. Hist.*, V, 29, 30: Frank, *ESAR* **4**: 106–107.

[30] Frank, *ESAR* **4**: 118.

[31] See last paragraph.

TABLE 79

SIZE OF ROMAN AFRICAN CITIES

City	*Summa Honoraria* (1,000's d.)		Area in hectares	Population estimate (1,000's)
	Office	Priesthood		
1 Carthage	38		288–325	38–50
2 Rusicade	20	82	210	20
3 Cirta	20		36+	20
4 Hadrumetum			160	20
5 Sicca Veneria			130	16
6 Thugga		50	49+	12.5
7 Thysdrus Col.			100	10
8 Hippo Regis	10		100	10
9 Lambaesis		12	30–112	10
10 Thignica			80	8
11 Pomaria			80	8
12 Volubilis			80	8
13 Leptis Magna			70	7
14 Vicus Augusti			70	7
15 Colonia Utinensis			70	7
16 Utica			65	6.5
17 Sitifis			65	6.5
18 Cartenna			65	6.5
19 Thapsus			57	5.7
20 Auzia	5			5
21 Bulla Regis	5		45	5
22 Avitta Biba			48	4.8
23 Leptis Minus			45	4.5
24 Theveste	4		9+	4
25 Cuicul	4		14+	4
26 Chemtou			40	4
27 Thibica			40	4
28 Thubursicum Numidarum	4	(1)6	100	4
29 Timgad	3–4		50	3–4
30 Abthugi			35	3.5
31 Uzalitanum Oppidum			34	3.4
32 Uchi Maius		12	20	3
33 Capsa		10	28	2.5
34 Diana	2–6	10		2.5
35 Mustis		10		2.5
36 Thuburbo Maius		10	32	2.5
37 Thuburnica			30	
38 Oued Scham	2.4			
39 Munchar	2.2	or .4		
40 Althiburos	2			
41 Tupusuptu		8		
42 Muzuc	1.6		40	
43 Henchir Sidi ben Nour (Sidi Navi)		6	100	
44 Henchir al Abiod (Bedd)		6	54	
45 Numlili		4		
46 Sutunurca		4		
47 Zama		4		

Sources: unless otherwise stated the sums for the *summa honoraria* come from Frank, *ESAR* **4**: 76–78 or Liebenam. The areas from the *Atlas...Tunisie* (*A.T.*) are accompanied by reference to the district.

1 Smaller area estimated from straight Roman streets in map of Carthage in *R.E.* Walled areas may have been as large as 368 hectares, see Kiepert, *Formae urbis antiquae*, X; Audollent, A., *Carthage Romaine*, Paris, 1901, map at end. A late writer gives 10.25 Roman miles as the length of the Roman wall which might enclose as much as 900 hectares, but this probably exaggerates. Beloch, *BGRW*, 485

2 Rusicade occupied the area of modern Philippeville of about 100 hectares, but the Roman city probably filled another 100 hectares along the road to Cirta.

3 The mesa of Cirta is about 36 hectares in area, but the Roman city probably occupied land across the gorge at Constantine.

4 Hadrumetum in *A.T.* (Sousse)

5 Sicca Veneria in *A.T.* (Le Kef).

6 Summa for Thugga from Carton, L., *Un campagne de fouilles à une grande cité de l'Afrique romaine*: Dougga, *Bulletin des Facultés*, Université du Nord, 47, Lille, 1898; area from Carton L., *Découvertes épigraphiques et archéologiques faites en Tunisie*, 152, Lille, 1895. See also *A.T.* (Teboursuk).

7 *A. T.* (El Djem).

8 *A. T.*

9 For plan of Lambaesis, see Cagnat, R., *Lambèse*, Paris, 1893 at end. The city proper had about 30 hectares, the army camp about 21 and the rest, in between, probably was also occupied.

10 Thignica, *A.T.* (Oued-Zerga).

11 Modern Tlemson, occupying the site of ancient Pomaria, has walls including about eighty hectares.

12 Carcopino, J., *Le Maroc antique*, 177, Paris, Gallimard, 1943; Chatelain, L., *Le Maroc des Romains*, 153, Paris, E. de Boccard, 1944.

13 Walled area 70 hectares; inhabited area may have been as large as 200 hectares. Romanelli, P., *Leptis magna*, 69, Rome, 1925.

14 *A.T.* (Sidi-el-Hani).

15 *A.T.* (Oudna).

16 *A.T.* (Porta Farina). From sea N. and E. to tombs and large buildings, Dauz' reconstruction (Reinach, S., *Atlas de la province romaine d'Afrique*, pl. II) gives a city of about 56 hectares with suburbs of 15 more.

17 Liebenam, 61.

18 Cartenna estimated from area of modern Mostagenam.

19 *A.T.* (Moknine)

21 *A.T.* (Fernana). Possibly smaller, about 35 hectares. Winkler, A., Notes sur les ruines de Bulla Regia, *Bulletin trimestriel des antiquités africaines* **3**: 112, 1883.

22 *A.T.* (Bou Arada).

23 *A.T.* (Moknine)

24 Ballu, A., *Tébessa, Lambèse, Timgad*, Paris, 1894. Assumed wall same in size as Byzantine wall, built A.D. 543, but earlier area was probably larger.

25 Ballu, A., *Ruines de Djemilla (antique Cuicul)*, Alger, 1921. The plan is on 52; estimated hard to make.

26 Chemtou or Col. Iul. Aug. Num., *A.T.* (Ghardimaou).

27 *A.T.* (Bou Arada).

28 Cagnat, R., *En pays romain*, 223, Paris, 1927.

29 Cagnat, R., et V. Chapot, *Manuel d'archéologie romaine*, 58, Paris, 1916; *summa*, Boissier, G., *L'Afrique romaine*, 195, Paris, 1895.

30 *A.T.* (Djebel Fuirino).

31 *A.T.* (Aine Djeloula).

32 *A.T.* (Soukoel Arba).

33 *A.T.* (Gafsa).

34 Liebenam, 58.

36 *A.T.* (Zachouane).

37 *A.T.* (Ghardimaou).

42 *A.T.* (Djebibina).

43 *A.T.* (Grombalia).

44 *A.T.* (Sidi-bon-Ali).

45 *A.T.* (Teboursuk).

Additional data about places in Mauretania Tingitana appear in: Tissot, M., Recherches sur la géographie comparée de la Mauritanie Tingitane, *Mém. à l'Acad. Inscrip. et Belles-Lettres* **9**: 139–322, 1878. They are surprisingly small.

cultivation holds good for the rest of the two provinces as for the imperial lands. It is assumed that the population of Africa fell off 38.7 per cent (the rate of decline in uncultivated lands) and 50 per cent for the

rest of the North African territory. The estimate for Tripolitana is a guess.[32]

Both the *summa honoraria* and the area of Roman Carthage suggest that it had a population of about 38,000 in the third century. The chief objection to this estimate is that Ausonius in the fourth century rated Carthage with cities such as Alexandria, Antioch, and Constantinople.[33] He said, indeed, that Constantinople was just in his time eclipsing the last named. Thus, we might expect that it was twice the size suggested. Ausonius is somewhat erratic in his alignment of cities and, indeed, may not have known much about Carthage of his day. He certainly gave little attention to eastern cities in comparison to those of the west. There is the chance that Carthage did increase in size as Cadiz faded from the picture. There are, in fact, two other problems besides Cadiz. The first is that Utica may have taken the place of Carthage after its destruction and retained it through a period until Carthage recovered, but the latter's recovery should have been complete by the end of the second century. The second possibility is that Rome acted in a way as a metropolis over much of the North African area. However, since the evidence to be presented later about acreage would tend to reduce the African population from even Beloch's estimate, we assume that Cadiz was still a factor in the second century but not Utica or Rome.

Within a few years (A.D. 429) the Vandals crossed the Strait of Gibraltar. Writing about 487, Victor Vitensis said that the Vandals were numbered at the crossing and were about 80,000.[34] He also states that exaggerated numbers persist to his day and, indeed, they were repeated by Procopius who said that although 80 chiliarchs were appointed the Vandals numbered only 50,000 men,[35] and while the Vandals numbered 80,000 men at their defeat, most of whom were killed. Furthermore, the Vandals were finally defeated and their power destroyed by a Byzantine army which probably numbered 10,000 infantry and 5,000 or 6,000 cavalry.[36] The century 429–529 was probably an era of increasing temperature which, in as warm a country as North Africa, did not tend to increase the population.

TABLE 80

SIZE OF CITIES IN GREECE AND THE BALKANS

City	Hectares	Population estimate	Century
Greece			
1 Corinth	480	50,000	
2 Athens	245	28,000	2nd
Balkans			
3 Thessalonia	234	35,000	3rd–5th
4 Byzantium	180	24,000	2nd–3rd
Constantinople	640–1,200	80–150,000	4th–5th
5 Dyrrhacium	95		
6 Salona	70		
7 Nicopolis	24		
8 Nicopolis ad Istrum	22		

Sources: 1 Inhabited area from map in Freeman, K., *Greek city states*, 89, New York, Norton, 1950; *DACL*; *R.E.* suppl. 6: 184.
2 Weller, C. H., *Athens and its monuments*, 54, New York, 1924.
3 Map in *EUI* and *DACL*.
4 See text.
5 Map in *R.E.*
6 *DACL*; *R.E.*, 2,005.
7 *R. E.* where earlier wall is considered to have enclosed a larger area.
8 Map in *R.E.*, 527.

2. EASTERN MEDITERRANEAN

The eastern Mediterranean divides easily into four divisions: Egypt, Syria-Palestine, Asia Minor, and Greece with the Balkans. The first two have outstanding metropolitan cities in Alexandria and Antioch. Asia Minor may well have to be considered as two districts: the west based probably upon Smyrna until Constantinople came to dominate and the east and central with possibly Ancyra as the chief city. The situation in the east and central district needs much further study. In Greece and the Balkans the confusion is very great until Constantinople extends its dominance over the area. The Balkan situation is rendered more difficult of understanding because its archaeology has not had the same attention which has been given to the other areas.

GREECE AND THE BALKANS

The population of Greece at the time of Augustus was estimated by Beloch to have been about 3 million.[37] This would give that country approximately the same density as that of Spain which it resembled geographically. The Peloponnesus and central Greece became the province of Achaia in Roman times: its largest

[32] An estimate for Numidia may be made upon the basis of data in Segré, A., *Byzantion* **16**: 441, 1942–1943. It deals with *capita annonaria* of about A.D. 445 (1600 reduced to 200). If each represented 120 actual *capita* (as in Illyria, *ibid.*) the number would be 192,000. This suggests a total Numidian population of 384,000.

[33] Ausonius, *Ordo Urbium Nobilium*, II, xxii, 269. He includes no other eastern cities than those mentioned in the text although many must have been larger than Braga in Spain, Aquileia in Italy or Bordeaux in Gaul.

[34] "Transiens igitur quantitas universa calliditate Geiserici ducis ut famam suae terribilem faceret gentis, ilico statuit omnem multitudinem numerari, usque ad illam diem quam huic luci uterus profuderat ventris. Qui reperti sunt senes, iuvenes, parvuli, servi, vel domini, octoginta milia numerati. Quae opinio divulgata, usque ad hodiernum a nescientibus armatorum tantus numerus aestimatur, cum sit exiguus et infirma." *Mon. Germ. Hist. Auc. Antiq.* **3** (1): 2; Migne, *Pat. Lat.* **58**: 182. Victor Vitensis, *Historia persecutionis Africae Provinciae.*

[35] *Hist. of the Wars*, III, v, 25; *Anecdota*, 18, 5.

[36] Diehl, C., *L'Afrique byzantine*, 16–17, Paris, 1896. Procopius, indeed, said that the Vandalic Wars, the Moorish uprisings and Justinian's reign reduced the population of North Africa by 5 million. *Hist. of the Wars*, III, xviii.

[37] Beloch, *BGRW*, 507.

city seems to have been Corinth with an inhabited area of about 480 hectares. This was about the proper size for a metropolis of an area of 3 million inhabitants. The second city was probably Athens. Its population can be estimated from the number of ephebes (young male citizens) trained each year. From the Life Table for Roman Greece [38] it would seem that the number of eighteen-year old boys should be about $\frac{1}{80}$ the total population. So the 200 ephebes of A.D. 240 should indicate a total of about 16,000 while the 300 Athenian and 52 foreign ephebes of *262/3* or *266/7* [39] should indicate 28,160 which is about what the Athenian walls of Hadrian of 245 hectares should hold.

The area between Greece and the Danube was estimated by Beloch to have had a population of about 2 million in the first century A.D.[40] Its area was about 430,000 sq. km. and thus was rather sparsely settled. This estimate rests in part upon the statement that there were 927 *decuriae* in the judicial district depending upon Salona and 450 in the district of Narona.[41] Beloch assumes about 400 persons to the *decuria* which gives 587,600 for these two districts. It suggests about 800,000 for all of Dalmatia and about 2 million for the Balkans. Thessalonica was probably the metropolis for the area and its 234 hectares [42] suggest a population of about 30,000, about the proper size for the metropolis of 2 million. The sizes of most of even the more important cities of the area are unknown.

What happened to the population of Dalmatia later is not easy to determine. Both Salona and Dyrrhacium added considerable areas during the period which should indicate much growth at least in the western part. Certainly its population should have increased with peace and rising temperature of the period. The population may well have risen to 3 million in the early part of the imperial period. The Civil Wars and consequent barbarian invasions of the third and fourth centuries possibly checked the development of population and may have driven some of the people into the older parts of the Roman territory. The introductions of tribes from across the Danube would seem to indicate a vacuum on the Roman side. Later the division between the two halves of the empire led to further trouble as the Visigoths wandered about in the peninsula. Perhaps the population in 540 was about the same as it had been in the time of Augustus.

EGYPT

The estimates of population of Roman Egypt have been largely influenced by two figures coming from that period: one by Josephus that Egypt without Alexandria had 7½ million,[43] and the other by Diodorus that Alexandria had 300,000.[44] Josephus apparently based his estimate upon inference from the revenue derived from the poll tax,[45] but since it touched only the adult men and varied from person to person his estimate remains largely conjectural. The problem may be approached both from the size of the cities of Egypt and from the land available for cultivation.

Alexandria had an area of about 920 hectares in the early empire but this had declined to about 640 hectares by the fourth century. In population Eusebius asserted that it was so much smaller that the number of men from fourteen to eighty years of age was less than those formerly between forty and seventy.[46] Using the Egyptian Life Table (table 30) one would gather that the latter number was just a little more than one-fourth of the former. However, Eusebius was no demographer. Two statements of numbers of dwellings seem to show that Alexandria had about 122,000 inhabitants in the fourth century and about 216,000 at an earlier date.[47] The city should, at 1½ per cent of the total population of the country, have been the metropolis for an area containing 14 million in the earlier period, probably the first century. The city, however, was the metropolis not only for Egypt, but probably for the eastern end of the Mediterranean and the commercial center for the Indian Ocean-Mediterranean trade. It thus was much larger than the population of Egypt itself would seem to warrant.

The cities of Egypt present singularly difficult problems. There is great uncertainty about not only the area but even the order of population size. They seemed to have numbered about 115 distributed somewhat unevenly.[48] Possibly the second city in size was Coptos where the Nile trade started its crossing to the Red Sea. Pelusium, Memphis, and Oxyrhyncus may have been about the same size. The areas and numbers of houses for such cities of the first rank such as Antinoe, Thmuis, and Hermopolis Magna do not suggest great urban populations unless the instance of 26 persons alleged to live in a tenth part of a house can

[38] See table 19.

[39] Frank, *ESAR* **4**: 493; Dumont, A., *Essai sur l'éphébe attique*, Paris, 1875–1876.

[40] Beloch, *BGRW*, 501–507.

[41] Beloch, *BGRW*, 462–463: from Velleius, II, 116 and Pliny, *Nat. Hist.*, III, 142.

[42] Assuming that the Roman area was about the same as the area within the walls.

[43] In the reign of Nero: Josephus, *Bellum Judaicum*, II, 16, 4.

[44] About 60 B.C. Diodorus, XVII, 52, 6.

[45] Johnson (Frank, *ESAR* **2**: 245) is inclined to accept the estimate on the assumption that Josephus had access to the census records. T. Walek-Czernicki would have a total population of 8½-9 million: La population de l'Égypte ancienne, Congrès International de la Population, *Demographie historique*, 7–13, Paris, 1938. Beloch (*BGRW*, 258–259) believes that the population of Alexandria was of the order of 500,000 but that the total for Egypt was only 5 million.

[46] Eusebius, *Hist. Eccl.*, VII, 21; trans. in Frank, *ESAR* **2**: 256.

[47] See p. 67.

[48] Jones, A. H. M., *The cities of the eastern Roman provinces*, 536–540, Oxford, 1937. The numbers were: Aegyptus 35, Augustamnica I, 16, Augustamnica II, 10, Arcadia 9, Lower Thebaid 10, Upper Thebaid 13, Libya 11, Pentapolis 11.

TABLE 81

ESTIMATE OF POPULATION OF EGYPTIAN CITIES

City	Number of units	Area in hectares	Population estimate	Date
1 Alexandria		920	216,000	1st cent.?
Alexandria		640	122,000	4th cent.?
2 Coptos				
3 Pelusium				
4 Oxyrhyncus		160	34,320	117
5 Memphis		224–364	34,000	
6 Hermopolis Magna	4,200			
7 Arsinoe		242	24,000	
8 Antinoe		150	20,000	
9 Heliopolis		140	16,000	
10 Heracleopolis Magna		116	14,000	
11 Thebes				
12 Athribis				
13 Thmuis	3,560			
14 Ptolemais				
15 Apollonopolis	1,273			
16 Philadelphia	920–1230		4,000+	25
17 Theadelphia	600–744 taxpayers		3,150	128–35
18 Karanis	575–644 taxpayers		3,297	144–6
19 Syene	805 taxpayers		2,265	171–4
20 Bacchias	700 taxpayers			
21 Aphrodite	570 taxpayers			6th cent.
22 Tebtynis	330+			
23 Village, Thebais			3,000	
24 Cyrene (Pentapolis)		70	8,000	

Sources: 1 Area estimated from East, W. G., *An historical geography of Europe*, 27, London, Methuen, 1948.

2 Largest city in upper Egypt. *R.E.*

3 First priority for citizens in assizes, before Oxyrhyncus and Memphis. Turner, E. G., Roman Oxyrhyncus, *Jour. Egypt. Archaeol.* **38**: 79, 1952.

4 The bakers were to have 856 artabas of wheat delivered in three installments, thus 286 in each. Frank, *ESAR* **2**: 371. An artaba produced thirty loaves of bread, two pounds apiece. *Ibid.* **2**: 371 (in A.D. 117). If each loaf of bread fed a family a day the population so fed would be about 34,320. The city was 1¼ mile long and about a half mile wide. Turner, *op. cit.*, 81.

5 Area from *R.E.*, 674. Strabo (807) gives it as next in size after Alexandria. Lower estimate from Baedeker, *Egypt and the Sudan*, 152, London, 1929.

6 Strabo (813) said it was no smaller than Memphis. Frank, *ESAR* **2**: 246.

7 385 taxpayers in one ward. Frank, *ESAR* **2**: 246. 6,475 Greeks in city; *ibid.*, 247. Estimate of area from Baedeker, *op. cit.*, 204.

8 Map in *DACL*. Four quarters with circumference of 3½ miles. Bell, H. I., Antinoopolis: a Hadrianic Foundation in Egypt, *JRS* **30**: 135–142, 1940.

9 Kamal, A. B., Héliopolis et son mur d'enciente, *Bull. soc. khédevale de géographie* **6**: 286, 1902.

10 Flinders Petrie, W. M., *Ehnasya*, pl. xliv, London, 1905.

11 At height under Egyptians had area of 3,700 *arouras* or 915 hectares. *Enci. Ital.* By Roman times had declined to series of villages.

12 Mentioned as outstanding city by Ammianus Marcellinus, XXII, 16, 4.

13 Mentioned by Amm. Mar. XXII, 16, 4. Frank, *ESAR* **2**: 246.

14 About 2,300 in east quarter; about 1,900 in west quarter. Frank, *ESAR* **2**: 248. Perhaps four quarters?

15 Frank, *ESAR* **2**: 246.

16 Boak, A. E. R., *Historia* **4**: 160–161, 1955. Romans not included.

17 A.D. 135. Frank, *ESAR* **2**: 246 n.1. Roberts, C. H., and E. G. Turner, *Catalogue of the Greek and Roman papyri in the John Rylands Library, Manchester* **4**: 67, Manchester Univ. Press, 1952; 748 poll tax payers in A.D. 128–129 and 682 or 744 in 134–135 according to Westermann. Boak, *Historia* **4**: 161, 1955.

18 About 1,000 taxpayers in A.D. 145–146 or 166–167, Roberts and Turner, *op. cit.*, 67: more accurately 575–644 about A.D. 171–174, Boak, *Historia* **4**: 157–160, 1955. The estimate is mine.

19 Frank, *ESAR* **2**: 246 n.1.

20 Bacchias, Frank, *ESAR* **2**: 246.

21 Bell, H. I., *Jour. Hellenic Studies* **64**: 23, 1944; assessed for the annona at 11,701 artubai about A.D. 400 and 6,053 in A.D. 531. Roberts and Turner, *op. cit.* **4**: 158.

22 Frank, *ESAR* **2**: 536.

24 Map in *Enci. Ital.*, and in Freeman, *op. cit.*, 195.

TABLE 82

SIZE OF LAND PARCELS TRANSFERRED IN EGYPT

Area of parcel (arouras)	Before A.D. 100	Second century	Third century	Abandoned lands A.D. 163 to 100	Leases		
	Sales and mortages				to 100	2nd	3rd
Less than 1	1	4	1	—	—	2	1
1+	2	11	2	2	4	6	2
2+	2	5	1	1	3	4	6
3+	2	2	5	2	3	12	2
4+	–	7<	3	1	6	3	3
5+	2	6	–	5<	5<	15<	7
6+	1	3	2	1	3	6	8<
7+	–	2	–	1	1	3	2
8+	–	2	3<	1	2	4	2
9+	1<	2	1	–	–	–	–
10+	4	9	7	–	4	11	3
15+	3	2	–	–	1	3	3
20+	3	–	3	1	6	4	2
30+	1	1	1		3	6	2
	22	56	29	15	41	79	43

Sources: the first three columns are drawn from Johnson in Frank, *ESAR* **2**: 150–161. The abandoned lands are listed: *ibid.*, 114–115 and the leased lands on 83–101. Medians indicated by check marks.

be considered typical.[49] Other houses fail to show heavy concentrations and indeed the family in Egypt does not seem to have been large.[50] The Karanis data show a density of about 169 to the hectare in 144–146 reduced by plague to about 113 by A.D. 171–174.

Another approach can be made from the standpoint of arable land. In 1870 it amounted to about 6,750,000 *arouras* and probably was not larger in the time of Augustus.[51] The modern increase has apparently been largely in the Delta which was certainly not as well tilled in antiquity as today. Elsewhere it is shown that probably a family upon good land required at least 10 *iugera* or 10 *arouras* for a living. It will be noticed in table 82 that the evidence does not suggest very small areas. When a woman asked for 5⅛ *arouras*[52] it would seem an amount sufficient for one person with minor children as dependents. The large farms would probably have an equivalent amount of labor. This assumption of 10 *arouras* to the ordinary family would give about 675,000 families. Making allowance for "cottars" might run the average to six to the family, giving a total of about four million. It is doubtful that more than a half million more should be estimated for the urban population. The population at the time of Augustus would thus be about 4½ million: the subsequent decline should have reduced the total population to 3 million in the fourth and fifth centuries.[53]

TABLE 83

SIZE OF ROMAN CITIES IN WESTERN ASIA MINOR
(Bithynia, Caria, Lycia, Lydia and Ionia, Mysia and Troad, Phrygia)

City	Area in hectares	Population estimate (1,000's)	Date
1 Smyrna	600	90	
2 Ephesus	345	51	
3 Nicomedia	228	34	Late Empire
4 Pergamum	160	24	
5 Cyzicus	160	24	
6 Mitylene	155	23	
7 Nicaea	120	18	
8 Miletus	117	15	
9 Aphrodisias*	120	10	Early 3rd cent.
10 Stratonicaea*		10	Late 2nd cent.
11 Philadelphia*		10	2nd? cent.
12 Rhodes	51	7.5	
13 Apameia Celenae	72		128 A.D.
14 Tralles*		3.75	1st cent.
15 Nacoleia*		1.5	Mid-2nd cent.
16 Tlos*		1.25	Mid-2nd cent.
17 Apateira*		.25	206–207
18 Termessus	40		

Cities marked* discussed in text below.

Sources: 1 Estimate of area from *R.E.*; Cadoux, C. J., *Ancient Smyrna*, Oxford, 1938, map at end.
2 Map in *R.E.*; Beloch, *BGRW*, 231, 486 suggests 415 hectares.
4 Map in *R.E.*
5 Beloch, *BGRW*, 487 for estimate.
6 *Ibid.*
7 Plan in *DACL*; also in Schneider, A. M., and K. Karnapp, *Die Stadtmauer von Iznik*, Berlin, 1938.
8 Map in Freeman, K., *Greek city states*, 137.
9 Total area about 550 hectares. but inhabited area probably about 120. From plan in de Laborde, L., *Voyage de l'Asie Mineure*, no. 104 (Gueira), Paris, 1838.
12 Map in *Enci. Ital.* (Rodi) assuming walls about as they were in Roman times. Rhodes at height probably had 200 hectares. Beloch, *BGRW*, 486.
13 Map in *DACL*, 2505.
18 Spratt, T.A.B., *Travels in Lycia* **1**: 240, London, 1847. Estimate from map.

[49] Cited by Johnson, Frank, *ESAR* **2**: 246.

[50] Other instances in Johnson, Frank, *ESAR* **2**: 248, 249: Calderini, A., La composizione della famiglia secondo le schede di censimento dell'Egitto Romano, *Pubblicazioni della U. Cattolica del Sacro Cuore*, serie III, scienze sociali **1**: fasc. I, Milan, 1924: Hombert et Préaux, 3–37.

[51] Johnson, Frank, *ESAR* **2**: 481. However, for 1880 the amount was 2,410,050 hectares. *Ibid.* **2**: 7. Another estimate is 10 million *arouras* at height, 6–7 early Byzantine and 8 at time of revival (seventh century ?). Segré, A., Note sull'economia dell'Egitto ellenistico, *Bull. Soc. Arch. Alex.* **29**: 299, 1934, cited by Segré, The Annona Civica and the Annona Militaris, Byzantion **16**: 393–44, esp. 397, 401 and 402, 1942–1943.

[52] See p. 49 and Frank, *ESAR* **2**: 95.

[53] For decline outside of Alexandria: Hunt, A. S., *Select Papyri*, 300–301, Cambridge, Mass., 1932; Frank, *ESAR* **2**: 246, 253. The fourth century *iugum* was sixteen *arouras*. Egypt then had four hundred thousand *iuga* and not over 7 million *arouras* in cultivation, according to the estimate of Segré: *Byzantion* **16**: 422, 424, 1942–1943. Préaux, C., Sur le declin de l'Empire au IIIe siècle de notre ère, *Chronique d'Égypte* **16**: 123–131, 1941. For decline at Karanis and Theodelphia, Boak in *Historia* **4**: 161–162, 1955.

TABLE 84

SIZE OF ROMAN CITIES IN EASTERN ASIA MINOR
(Galatia, Pontus, Lesser Armenia, Lycaonia, Isaura, Cappadocia, Pamphylia and Pisidia)

City and Province	Area (hectares)	Population estimate
1 Ancyra, Galatia	225	34,000
2 Antiocheia, Pisidia	130	17,000
3 Isaura	121	12,000
4 Trebizond, Pontus	105	10,000
5 Perga, Pamphylia	36	3,600
6 Sagalassus, Pisidia		
7 Iconium, Lycaonia		
8 Caesaria Mazaca, Cappadocia		
9 Amaseia, Armenia		
10 Tyana, Cappadocia		

Sources: 1 Estimated from *Die Welt des Islams* **20**: 85 abh. 35, 37, 1939.
2 See app. A.
3 Wall about 2½ miles in circumference. Magie, D., *Roman rule in Asia Minor* 453, Princeton, Princeton Univ. Press, 1950.
4 Lynch, HF. B., *Armenia, travels and studies* **1**: 30, New York 1901. This was the area of the Byzantine city which may have been larger than in Roman times.
5 Texier, C., *Asia Mineur*, 710, Paris, 1862.
6–10 These are some of the larger cities of the area. The area of Perga which ranked as a considerable place would indicate that cities there in general were small.

ASIA MINOR

The approach to the population of Asia Minor by way of the metropolitan centres involves some difficulty. It would seem that the southeast part, notably Cilicia, probably fell within the influence of Antioch in Syria. The great city of Smyrna seems to have been the metropolis of much of the western half of the peninsula. However, by A.D. *72* the interior of the peninsula with certain of the maritime provinces had been united into the great province of Galatia with Ankara (Ancyra) as its capital. This area may well be regarded as a unit for study even though it was cut up into many provinces in the following centuries.[54] At the end of the period there is the question of the extent of influence of the new imperial capital of Constantinople upon Asia Minor.

TABLE 85

POPULATION ESTIMATES FOR ASIA MINOR

Area	Broughton's estimate	Estimate about A.D. 100	Est. 5th cent.	Turkey 1935
	(in hundred thousands)			
Cilicia-Isauria	900	600	600	659
Western section	6,300	6,000	5,000	4,971+
Eastern section	4,800	2,200	6,000	6,809
	12,000	8,800	11,600	12,439

Cilicia-Isauria: Turkish vilayets of Icel and Seyhan.
Western section: Roman provinces, see Table 83.
Turkish provinces Bolu, Bilecik, Eskisehir, Afyon, Isparta and Antalya and those to the west of these in Asia Minor. The Turkish group fails to include the islands held by Greeks and Italians in 1935 and part of the vilayet of Istanbul.
Eastern section. Roman provinces, see table 84.
Turkish vilayets include Konya, Ankara, Cankiri, Kastamonu, Sinop, Zonguldak, Corum, Samsun, Amasya, Yozgat, Tokat, Kirsehir, Nigde, Kayseri, Maras, Malatya, Elaziz, Sivas, Ordu, Gireson, Erzincam, Gumusane, Trabson, I leave out some vilayets in Syria and Mesopotamia which Broughton includes.

Beloch and Broughton agreed that the province was a rich area which with the rest of the peninsula should have had about 13 million people. In part their very high estimate was based upon some data about certain of the larger cities which much exaggerated their size. Had the cities actually been of the size assigned to them, an estimate of 13 million would probably have been, as Broughton thought, rather low.[55] Galen, the great physician, writing of Pergamum, said "If then our citizens amount to as many as 40,000. Likewise if you add their wives and slaves, you will find yourself admitting that you are richer than 120,000 people." [56] Since Pergamum had an area of only 160 hectares, it is very unlikely that the inhabitants of the city numbered more than 24,000. Perhaps the total area dependent upon Pergamum may have contained so many as the 200,000 thus suggested but that is a very different matter. Aurelius Barenius is stated to have fed 40,000 citizens of Ephesus early in the third century.[57] Again it is very unlikely that Ephesus' 345 hectares held more than 51,000 persons. Thus such figures, usually very large, cannot be held to represent the population within the cities themselves.

There are two cases of *summa honoraria,* for Aphrodisias and Apateira.[58] The former was 10,000*d* and the latter for 250*d*. We might expect that the population would be represented by the same numbers. The case of Apamea Celaenae is somewhat more complicated. It has an area of about 72 hectares and might, therefore, have been expected at 125 to the hectare to have a population of 9,000. A citizen here apparently invested 34,000*d* at 12 per cent to pay the curator's fine: this would then be 4,080*d*.[59] The total number of pence then might well be about half of the total which perhaps is the poll tax.

A case of a donative gives the principles which were used: usually in multiples of pence, including wives, freedmen, but varying with the importance.[60] How-

[54] Magie, D., *Roman rule in Asia Minor*, 491, 494, 561 and 574, Princeton, Princeton Univ. Press, 1950.
[55] Beloch, *BGRW*, 242; Frank, *ESAR* **4**: 812–816, a veritable mine of information. The total in the table on 815 should be twelve million.
[56] Frank, *ESAR* **4**: 812–813, citing edition of Galen by Kuhn, V, 49.
[57] Frank, *ESAR* **4**: 813.
[58] Frank, *ESAR* **4**: 761 and 768.
[59] Frank, *ESAR* **4**: 769.
[60] *Ibid.* **4**: 785.

ever, the greatest number would naturally go to ordinary freemen and women so that it might well be presumed that the total of the unit represents the adults. Children do not seem to be included. Tralles' general donative might then represent a population 3,750 with its 2,527.[61] On the other hand the 10,000*d* [62] general donative at Stratoniceia seems to represent less than 15,000. The gift of 10,000*d* at Philadelphia is of the same class.[63] At Nacoleia a foundation of 200,000 sesterces was set up to purchase grain for three years: thereafter the income from the principal was to provide a donative on the emperor's birthday.[64] At 12 per cent this would provide a donative of one denarius to 1,500 persons. Finally at Tlos a foundation was formed to provide for a quinquennial festival and an annual distribution of 1*d* to the sharers of the grain,[65] presumably on the other four years. A comparison of the area of the cities would provide some illuminating information, but they seem to show a relatively small size of cities.

The population of Smyrna would in our estimate be about 90,000 which is 1½ per cent of about 6 million people. This would be about the population assigned by Beloch and Broughton to the Aegean provinces of the peninsula. However, it is possible to differ markedly about the population of the eastern half, which is largely a self-contained area. Its early capital and probably continuing center was Ancyra (Ankara). Fortunately there are available estimates of its surface based upon an archaeological survey.[66] Its Roman area was about 225 hectares which at 150 to the hectare assumes a population of about 34,000. At 1½ per cent of the total, it should have been the center for about 2,250,000, which is much below the usual estimates. However, Ancyra continued to grow and was about 225 hectares in area in early Byzantine times in spite of the fact that its territorial jurisdiction was reduced several times in the second, third, and fourth centuries. By that time it was just the capital of a relatively small province, although it probably remained of some importance as an economic center. The breaking up of the great Galatian province probably indicates urbanization and constant growth in population. The fifth-century estimates are guesses based upon apparent development of the area.[67]

TABLE 86

SIZE OF CITIES OF ROMAN SYRIA

City	Area (hectares)	Population estimate	Date
Antioch	1,750–2,100 (walls)		4–5th cent.
	900–1,200 (area)	90,000	
Apamea	250	37,000	
Palmyra	220	33,000	At height, 3rd cent.
	135	20,000	
Damascus	213	31,000	
Bostra	400–	30,000	
Tyre	75	20,000	
Heliopolis (Baalbek)	91	13,500	
Sidon	66	12,000	
Jerusalem	72	10,000	Time of Herod
Aradus	33	7,000	
Dura-Europos	42	6,000	

Sources: Antioch, inhabited area estimated from maps in *DACL*, *Enci. Ital.*, and *R.E.*
Apamea, area given by Cumont, F., *JRS* **24**: 189, 1934.
Palmyra, map in *EUI*.
Damascus, map in *EUI*.
Bostra, Bouchier, E. S., *Roman Syria*, 45, Oxford, 1916; circuit of five miles.
Tyre, Beloch, *BGRW*, 487. Many storied houses mentioned in Bouchier, 136 as well as density and wealth of population.
Heliopolis, *R.E.*, suppl. **4**: 722.
Sidon, map in Rawlinson, G., *History of Phoenicia*, 67, London, 1889.
Jerusalem, map in Smith, G. A., *Atlas of the historical geography of the Holy Land*, 47–48, London, 1915; Beloch, *BGRW*, 486.
Aradus, alleged to have had buildings of several stories, Rawlinson, *op. cit.*, 73–74.
Dura-Europos, map in Rostovtzeff, M., *Dura-Europos and its art*, 40, Oxford, 1938.

SYRIA

The province of Syria was roughly three-fourths the size of the province of Asia in the hands of the senators and might be expected to be of about the same order of fertility. Excluding (as was done) Lycia and Bithynia, the population of the province of Asia was estimated at somewhat more than 5 million. Under this comparison Syria should have had about 4 million. Apamea as a city state and district seems to have had about 117,000 *homines* but its proportion of the Syrian total is not at all clear.[68] A second approximation is provided by Antioch as a metropolitan center. Its 90,000, if that is correct, should have been a center for about 6 million. However, it may have served as such for Cilicia and Isauria, which were also parts of the Diocese of the Orient,[69] thus adding substantially to the 4.4 million estimated to Syria. Then Antioch was a very great commercial center and may have had a larger than expected population as a result. If Apamea was the second city in size, its size was about proper for a second city in a population of 4.3 million.

The usual large estimates of civic size occur for

[61] *Ibid.* **4**: 766. The city was also given 60,000 *modii* of grain at one time. This would have been about 16 *modii* a person, probably a year's supply.
[62] *Ibid.* **4**: 759.
[63] *Ibid.* **4**: 765.
[64] *Ibid.* **4**: 772, assuming sixteen HS to a denarius.
[65] *Ibid.* **4**: 782.
[66] Areas estimated from *Die Welt des Islams* **21**: abh. 35, 37, 1939.
[67] That is: 6 million for the eastern part and 5 for the western.
[68] See p. 48.
[69] The provinces of A.D. 395 were Palestine I, II, III, Syria I, II, Phoenicia I, II, Cilicia I, II, Cyprus, Commagene Osrhoene, Isauria, Mesopotamia, and Arabia.

Antioch: Libanius saying that it had 150,000 persons [70] and Chrysostom 200,000 without children and slaves.[71] Ausonius reckoned it after Constantinople and Carthage and ahead of Alexandria and Treves, all of which only goes to show that it was a large city.[72] The walls extended from the river to the steep ridge paralleling the river and included about 2,000 hectares: of this about one-half seems to have had substantial buildings upon it. Furthermore, it was a garden area with population not pressing heavily upon the site. In addition it was a caravanserai, that is, a site which cared for many caravans trading across the desert and the caravanserai often covered a lot of space sparsely. Antioch thus probably had a population of about 90,000. The area probably did not decline much in total population since there was little contraction in Syria.

3. NORTHWESTERN EUROPE

GAUL

The territory of Roman Gaul, or as it was called, the three Gauls, with its territory of 535,000 sq. km. was not much smaller than Spain and was about twice the size of Italy with Sicily. For its population at the time of its conquest by Julius Caesar there are data submitted by its conqueror which have been discussed widely. Beloch estimated Gaul's population at about 5.7 million,[73] which is a fraction of the numbers which several French historians are wont to credit to their country in Roman days.[74] In addition to Caesar's data there is information about the size of the metropolitan cities, Narbonne (later Toulouse), Lyons, and Trèves, and the total which their size would seem to imply. These cities, together with other cities, can be compared with respect to their population in the thirteenth–fourteenth centuries. There is also some evidence for the decline of population in the first four centuries of our era.

Strabo evidently thought that the two great centers of Gaul in his day were Lyons and Narbonne. The latter surpassed the rest of the Celtic area as a trade center and was larger than Lyons.[75] An exact estimate of Narbonne as a Roman center is not available but, in view of Strabo's words, it must have been larger than the 163 hectares (or thereabouts) of Lyons. Some of the other southern Gallic cities had very extensive walls about them which evidently represented the first-century hope that the population would fill them. The failure of their hope is indicated in the small size of the fourth-century walls. However, it is reasonable to assume that Narbonne was larger than the others and thus is estimated as having about 240 hectares, a bit larger than Nîmes. The area of Lyons is better known and was about 163 hectares as mentioned above. Trèves was the great city of the Gauls in the later period and reached 285 hectares when in the fourth century it was in a sense the capital city of the western part of the empire. In this period and especially under the Visigothic rule Toulouse replaced Narbonne as the southern metropolis, reaching about 212 hectares in size. In the first period the three cities at 150 to the hectare would have had about 100,000 in population and have been the centers for a total population of about 6.6 million at 1½ per cent.

The data offered by Caesar have been widely discussed with the result that his figures are regarded as indicative of a relatively small population. The total assigned to the Helvetii and four allied tribes was only 368,000: this was supposed to be based upon a count.[76] If the sixty tribes of Gaul averaged as did these five, the total should have been about 4 million with, of course, a large number for Provence. Elsewhere, he lists the numbers (296,000) of soldiers sent by the Belgic Gauls.[77] These in at least one case were said to be three-fifths of the men available. Thus, if the number is multiplied by .6 to get the total men, again

TABLE 87

SIZE OF CITIES OF SOUTHERN GAUL

City	Area (hectares)			References	
	First century	Third–fourth centuries	Thirteenth century	Grenier	Lot
1 Narbonne	240?	15, 20	54		1:311, 337
2 Nîmes	220, 275	20, 32		315, 316, 354	1:354, 372
3 Avignon		20	151		1:157, 159
4 Toulouse	60	100	289		1:337
5 Bordeaux	90	31, 40	275	356–425	2:308, 394, 396
6 Marseilles	28–36		65	286	1:174–176
7 Poitiers		42, 50	200	420	1:577–578
8 Arles	27	16	48	290, 294	1:167–169
9 Fréjus	35, 40		10	307	1:465, 470
10 Cahors		14	25.5		2:234–235
11 Orange	200	12	16		1:130, 135
12 Agen		11	57		2:462–463
13 Bayonne		10		425	
14 Dax		3		425	

Sources other than Grenier and Lot, *Recherches*: 1 see text; 4 Dickinson, 111, map on 120; 5 Jullian, C., *Ausone et Bordeaux*, 120, Paris, 1893.

[70] Heichelheim in Frank, *ESAR* **4**: 158 citing Libanius, *Ep.* 11, 19, 37.

[71] Chrysostom, *Homil. in Ignat.* 4 (*Pat. Gr.* **50**: 591); *Homil. 85* (86) (*Pat. Gr.* **58**: 762).

[72] Ausonius, *Ordo Urbium Nobilium*, II, xxii. Written about A.D. 388–389.

[73] Die Bevölkerung Galliens zur Zeit Caesars, *Rheinisches Museum* **54**: 414–438, 1899. Earlier he had estimated it smaller. Beloch, *BGRW*, 507.

[74] A. Grenier: 15–20 million, Frank, *ESAR* **3**: 555; 24 million in *Les Gaulois*, 225–231, Paris, P. Payot, 1945; C. Jullian, 30 million in *Hist. de la Gaule* **5**: 27; Lot, 20 million in *La Gaule*, 66–69, Paris, A. Fayard, 1947.

[75] Strabo, *Geog.*, IV, 1, 12; IV, 3, 2.

[76] Caesar, *B. G.*, I, 29.

[77] *Ibid.*, II, 4.

TABLE 88

SIZE OF CITIES IN CENTRAL GAUL

City	Area (in hectares)			References		
	First century	Third–fourth centuries	Thirteenth century	Ganshof	Greiner	Lot
1 Lyons	163	113			331, 356	
2 Valence		40			324, 356	1:114
3 Vienne	225	36	36		356	1:18
4 Orleans		25, 30	150	12, 59	421	
5 Bourges		26	115		356, 420	2:72–74
6 Sens		34	42		412, 420	2:577
7 Paris	6	8	273, 439	12, 59	420	
8 Saintes		18	30			2:470, 541
9 Nantes		13, 18			422	2:470
10 Troyes		16	99.37	12, 45, 59		
11 Angoulême		13, 14	48			2:470, 496
12 Autun	200	12	80		339, 354, 356	
13 Limoges		11–12	32			2:243, 288
14 Beauvais		11	103		425	
15 Dijon		11	104		409	
16 Le Mans		10	7–8	12	424	2:105
17 Évreux		9	30		424	2:105
18 Grenoble		9	20			1:60
19 Amiens		8	140	12		
20 Rennes		10			417, 420	
21 Tours		6	175		424	
22 Clermont		3	38			2:105, 11

Sources other than Ganshof, Grenier and Lot, *Recherches:* 11 Only 40 hectares inhabited; 12 T. G. Taylor, *Urban geography*, 135 New York, Dutton, 1946; 14 Lot, *End of the ancient world*, 71–72; 20 Lot, *End*, 71–21; 21 Boussard, J., Étude sur le ville de Tours du Ier au IVe siècle, *Revue des étude anciennes* **50**: 313–329, 1948.

TABLE 89

SIZE OF CITIES OF NORTHERN GAUL

City	Area (hectares)			References	
	First century	Second–third centuries	Thirteenth century	Ganshof	Grenier
1 Trèves		285	120?	11, 58	356, 420
2 Rouen		13–14	224		421–422
3 Mainz	81, 90	120	90	11	356, 404, 420
4 Cologne	96.8	96.8	320, 401	11, 58	
5 Metz		70	221	11	356, 420
6 Reims		60–65	120	12	
7 Strasbourg	20	20	193	12, 58	406–408
8 Worms		69	69	11	
9 Tournai		12	50, 175	45, 58	
10 Aachen		50	175	45, 58	
11 Ghent			80, 644	45, 58	
12 Bonn		25	43	13, 45	
13 Maastricht		2		13	
14 Soissons		12			425
15 Avenches	150	9			355, 356
16 Basel		5.4	30	12	
17 Bruges			70, 430	45, 59	
18 Brussels			79, 449	45, 59	
19 Louvain			60, 410	45, 59	
20 Antwerp			31.5	45	

Other sources than Ganshof and Grenier: 2 Dickinson, 319, 346: Lot, *Recherches* **2**: 470; 4 Dickinson, 84; 6 Lot, *Recherches* **2**: 577; 7 Püschel, 209.

by 4 to get the total of the tribes, and by 4 again for all Gaul, an estimate of 8 million is attained. The territory occupied in Caesar's time by the *Aulerci Cenomanni* with about 65,000, that is Haute Maine or the department of Sarthe, has five or six times as many now.[78] Here the problem of large round numbers appears which usually indicates an exaggeration. It is difficult to believe that if Gaul had really had 20 million that country could have been conquered so easily by Caesar.

Another approach can be made by comparing the size of cities of the third–fourth centuries with the same cities of the early fourteenth century when the hearth tax on France gives the basis for an over-all estimate. Here there are difficulties as one can see by examining the tables on cities. Eight cities of the southern part show an increase from 367 to 1,061 hectares or about three times.[79] Seventeen cities of the Lyonese province (leaving out Paris) increase from 262 to 1,244 hectares or five times.[80] The Belgian cities (that is of Belgian Gaul) are most difficult because several of the greater

[78] Latouche, R., Aspect démographique de la crise des grandes invasions, *Population* **2**: 683, 1947.

[79] The cities of Avignon, Toulouse, Bordeaux, Poitiers, Arles, Cahors, Orange, and Agen.

[80] The cities of Vienne, Orleans, Bourges, Sens, Saintes, Troyes, Rouen, Angoulême, Autun, Limoges, Beauvais, Dijon, Le Mans, Évreux, Grenoble, Tours, and Clermont.

TABLE 90

AREA OF ROMAN CITIES IN BRITAIN

Rank Name	Hectares	Rank Name	Hectares
1 London, 63	133.5	12 Aldborough, 61	24.3
2 Cirencester, 54	97.1	13 Chester, 59	22.7
3 Verulamium, 45	80.9	14 Caerleon, 56	20.2
4 Wroxeter, 58	68.8	15 York, 60	20.2
5 Winchester, 51	55.8	16 Carlisle, 61	20.2
6 Colchester, 44	43.7	17 Canterbury, 49	16–20.2
7 Leicester, 57	42.5	18 Glevum, 54	18.6
8 Silchester, 50	42.1	19 North Chesterton, 47	17.8
9 Chichester, 51	41.7		
10 Exeter, 53	36.8	20 Caerwent, 55	17.8
11 Dorchester, 52	34.8	21 Lincoln, 47	16.6

Source: the figures after the names of the cities are the page numbers in H. C. Darby, *An historical geography of England before* A.D. *1800*, Cambridge, 1936.

cities of the Low Countries rose from practically nothing to very great size. Obviously the rate of increase varied from medium in the south to a very large one in the north. If we assume, what is probably not too inexact, that the Lyonese group represents the increase best the population of fourth-century Gaul should have been about one-fifth of the same area in the early fourteenth century. Adding for the Low Countries and parts of France not included in the 1328 hearth tax the total was probably about 25 million. Thus the population of Gaul of the fourth century could be estimated at about 5 million.[81]

On the course of population one item of importance remains. Constantine reduced the *capita* upon the Aeduans (capital, Autun) from 32,000 to 25,000,[82] presumably from the population of the third century when it was probably at its height. This was probably an actual reduction of population from 64,000 to 50,000 since the *caput* probably represented two persons.[83] Gaul had at the time about 115 *civitates;*[84] if Autun and its lands were average (which its 12 hectares might indicate)[85] the total in the time of Constantine would be about 5,600,000. If the decline there was also average, the population of Gaul should have declined 22 per cent from about 6.4 million. Of course, one city is a very narrow base for an estimate but it does seem to fall close to the other estimates.

The decline in population in Gaul probably reached its bottom toward the middle of the fifth century. At this time occurred the great migration of Britons which did much to fill Brittany. At the same time the tribe of the Franks moved into the area in considerable numbers. It seems to have been like earlier Germanic migrations, a ruling class for most of the area, but in the northeast it was part of a settling Germanic mass which moved the language line to the west permanently. The survival of the Romanic tongue elsewhere would show that, although Romance population decreased, it did not evacuate the territory. The aggressiveness of the Franks would seem to show that in the early sixth century the population was increasing. Probably by 543 it was about where it was in the time of Constantine.

[81] See p. 106, table 105.

[82] Frank, *ESAR* **3**: 605.

[83] See p. 49.

[84] See list in *Mon. Germ. Hist. Chr. Minora* **1**: 552 of about A.D. 390–413.

[85] The cities in the lists are, for the most part, the larger places.

BRITAIN

The Roman population of Britain has been the subject of some rather generous guesses.[86] Fortunately the size of most of the cities are known and two have been excavated so that rather significant information exists about them. The size of the larger places is given in table 90.

Of the cities Silchester has about 80 houses, some of which were very modest, and Caerwent about 100,[87] probably indicating populations of perhaps 280–360 and 350–450. The number to the hectare is less than 10 for Silchester and about 25 for Caerwent. London was not very thickly settled and cannot have had a much greater population density than Caerwent. Even at 30 to the hectare the population of London would be only about 4,000 which at 1½ per cent of the total would suggest a population of less than 300,000. The villages and villas (assuming 2,500 of them) were very small as most Celtic hamlets were and can be estimated at little more than 40 apiece which would give 100,000 as the village population. Still another approach is by way of the short dark folk (the *servi* of Domesday)[88] of whom there were approximately 100,000 about 1086. If England of Roman days was like Wales of the fourteenth century, it would have had an equal number of free and *servi*. Assuming a relatively stable number of *servi* over the centuries the Celtic population should have been about 200,000 with the Romans in addition. Probably the total population of Britain (all the islands) was not greatly in excess of 350,000.[89]

[86] The smallest is 500,000. Collingwood, R. G., Town and country in Roman Britain, *Antiquity* **3**: 261–276, 1929. Higher guesses are: Randall, H. J., Population and agriculture in Roman Britain, *Antiquity* **4**: 80–90, 1930 (1½ million); and Wheeler, R. E., Mr. Collingwood and Mr. Randall; a note, *Antiquity* **4**: 91–95, 1930.

[87] For Silchester see *Victoria County History, Hampshire* **1**: 274, 350–372 and for Caerwent, F. Haverfield, *The Roman occupation of Britain*, 199, Oxford, 1924, and *Archaeologia* **80**: 229 ff., 1931.

[88] My short, dark folk of England, *Social Forces* **24**: 340–347, 1946.

[89] Another approach is by the use of the formula on p. 69. Silchester is number 8 and Caerwent 20, thus an average of 14

$$\text{Thus } 360 = \frac{C \times \left(1 + \frac{\sqrt{13}}{10}\right)}{14}, \quad C = 3{,}700.$$

If the total for Roman Britain at the height of its prosperity was only about 300,000 it must have declined as Roman power slipped, and drastically as the Roman Army was withdrawn.[90] The bottom of the numbers may well have been about 200,000 from A.D. 410 to 443. From this time the chronological eras may be estimated about as follows. The first was a fierce struggle between free Celts and incoming Anglo-Saxons, entering in relatively small groups all over England to about 472.[91] The Celts, badly outnumbered, migrated in large numbers to Brittany or, in smaller groups, to the west. From 472 to 516, that is, from the victory of Ambrosius Aurelianus to the Battle of Mount Badon under Arthur, the two fought, now one, now the other winning. From 516 to the middle of the century peace was general but the population of England was much greater than it had been under the Celts or Romans.[92] We shall estimate the population just before the Black Death of 543 as in the vicinity of half a million.

The organization of Germany in this period may be surmised from two sources: (1) the information in Tacitus' *Germania* and (2) the organization of England, probably of about A.D. 600, as portrayed in the Tribal Hidage. The use of Tacitus assumes that his work is reasonably accurate while the use of the Tribal Hidage assumes (1) that it really represents the status of England of about A.D. 600 (or 543) and (2) that the Germans in England established the types of settlement there which they had known on the continent. The settlements of the Germans in Germany may to some extent be located by the finds of coins, pails, bronze vessels, and other articles conveniently mapped in a recent publication.[93] Archaeological excavation has shown that Germany was possibly more advanced than Tacitus suggests.[94] The sources thus are not too clear in their picture of the situation within Germany.

The social structure and particularly the relationship of the army within Germanic society is not clear from Tacitus. The army apparently consisted of chiefs with retainers fighting presumably under a king or general who also had his retainers.[95] When not fighting the soldier is alleged to have spent his time in hunting or in idle occupations leaving the *agrorum cura*[96] to the women, the elderly and the weak. The chiefs were supported by gifts of food and cattle and later money.[97] The chiefs used heavy armor which must have been fairly expensive.[98] Into this picture must be fitted the four ranks of persons: king, nobles, *ceorls* in England above the *geburs, geneats,* and cottars.[99] It would seem that the *ceorls* ought to be the retainers of the nobles in this picture. Since an early document states that in the eighth century every thirty hides (lands of one family) were expected to send up five soldiers, it looks as if six hides ought to support one soldier: that is, a village of ordinary size ought to support the soldier.[100]

On the other hand it is difficult to believe that the Germans on migration did not all fight whether they had been accustomed to do so in their homeland or not. Tacitus gives the impression that some of the German tribes were not particularly belligerent.[101] Fighting does not seem to have been the sport of all free Germans as it seems to have been for free Celts. This perhaps tends to explain why the Celts with a less populated area could hold off the Germans as well as they did.

The Tribal Hidage presents apparently independent units of the following numbers of hides:[102]

300	5	1,800	1	7,000	6
600	11	3,500	1	15,000	2
1,200	3				

Single cases of two, four, and five thousand hides seem to belong to the Celtic divisions of the island. Here it would seem that the king was over the two larger units, the nobles normally over the 600 unit group (as well as the other small units). These were probably the *regiones* or provinces mentioned in early literature. Thus the summons to a *fyrd* of the 600 hide area should have brought out one hundred soldiers.

If we can assume a soldier for each six hides of land or families, it should mean about one soldier to each twenty-four in the population. On this basis we can make an estimate for Germany, in the case of both Arminius and Marbod. The latter, the leader of the Marcomanni, is alleged to have founded a powerful state centering in Bohemia. He is said to have had

[90] Frank, *ESAR* **3**: 12–13, 84–85.

[91] For this reconstruction of dates: Russell, J. C., Arthur and the Romano-Celtic frontier, *Modern Philology* **48**: 145–153, 1951.

[92] Loth, J., *L' Émigration bretonne en Armorique du Ve au VIIe siècle de notre ère,* Paris, 1883: Lot, F., Bretons et Anglais aux Ve et VIe siècles, *Proc. Br. Acad.* **16**: 327–344, 1930.

[93] Brogan, O., Trade between the Roman Empire and the free Germans, *JRS* **26**: 199, trade routes; 204–205, coins; 206–207, pails; 208, bronze vessels; 209, statuettes; 211, brooches; 216, pottery; 217, glass; 1936.

[94] Emphasized by A. Dopsch: Von Altertum zum Mittelalter, Das Kontinuitätsproblem, *Archiv für Kulturgeschichte* **16**: 159–182, esp. 177, 1925. Ptolemy, for instance, mentions the cities of the Germans.

[95] Tacitus, *Germania,* 13; Stenton, *Anglo-Saxon England,* 301.

[96] Tacitus, *Germania,* 15. Is this farming or supervision of others?

[97] *Ibid.*

[98] *Ibid.*

[99] Stenton, 466–468. For a different conception of the *geneat:* Russell, J. C., The short, dark folk of England, *Social Forces* **24**: 345, 1946.

[100] Stenton, 288.

[101] Tacitus, *Germania,* 35 ff. On the problem of whether the peasant fought: Stephenson, C., The problem of the common man in early medieval Europe, *Amer. Hist. Rev.* **51**: 419–438, 1946 and L. Thorndike's reply in the same volume, 802–803.

[102] See table 97.

70,000 footsoldiers and 4,000 horsemen.[103] Some twelve legions (about 60,000) are said to have tried to defeat him.[104] If the ratio of one to twenty-four held, Marbod should have dominated an area containing about 1,776,000 persons. This should have covered a good part of Germany as well as Bohemia. The other great German leader of the time was Arminius who is supposed to have had an army about the same size as that of Marbod.[105] In any case he defeated Varus who had three legions (15,000) and destroyed them as a fighting force. It is quite likely that he had a much larger army than did the Romans. Arminius dominated the western half of the German area.

The area held by the Germans to A.D. 180 was apparently bounded by the Rhine and the Danube, then by a line to about the mouth of the Vistula and from there by a line across the central part of Scandinavia. In area it would be about 1,180,000 sq. km. This would be about eight times the size of England, and, given the same density of population, would have numbered about 4 million people. However, the German territory covers more mountainous and swampy land proportionately than did England. Both Germany about A.D. 150 and England about A.D. 540 contained so many people by German standards that emigration followed.[106] Probably the area held somewhat less than 4 million. This would give it a density of between three and four to the square kilometre. Colonizing efforts in certain localities declined in the fourth and fifth centuries but with bettering conditions increased in the sixth and especially in the seventh centuries.[107] About the fourth century the fairly populous area about Göttingen still had a low average in density.[108]

4. NORTHEASTERN EUROPE

The northeast block of Europe is considered in this period a great quadrangle bounded on the south by the Danube and the south shore of the Black Sea, on the west by the northern reach of the Danube, on the north by the Gulf of Finland and the Volga to its turn south, and on the east by a line drawn down the Volga to its eastern bend and straight to the eastern end of the Black Sea. The land in this area contains about 1,200,000 square kilometres. It holds surprisingly few mountains but is in its eastern extent largely steppe.

The population in the early period was largely Slavic in the eastern central portion and semi-nomadic in the south. The Germans drove southwest to cover great areas north of the Black Sea and in the Balkans about A.D. 170–200. The chances are thus that (1) the population was quite sparse in the initial period and (2) it increased fairly rapidly during the latter part, notably with the increase in the number of the Slavs. Given a family (perhaps four) to 2 square kilometres, the area would have a population of about 4,800,000, but this is a broad conjecture, for the later part of the period.

The area of sparse farming would range from a southern limit of south Switzerland to just beyond the Sea of Azov (leaving out the territory south of the Danube) about 2,500 kilometres and north about 800 kilometres, a total area of about 2 million square kilometres. Treating this as a unit for the first part of the period at a family for each 2 square kilometres, again one estimates a population of about 4 million.

The area of central Asia was an area of about 4,800,000 sq. km. which, because it was dominated by China, has some population evidence even for the first century B.C. Presumably the population tended to remain within the limits of subsistence available in the period varying through a cycle of about four centuries. Following the peak of moisture the decline of pasture area drove out the semi-nomadic groups whose migrations produced such European invasions as that of the Huns in the fifth century, the Hungarians in the ninth and the Mongolians in the thirteenth. The figures are naturally very tentative (table 91). The population is just a little more than a person to the square kilometre. This still leaves a gap of an area (1,600 × 500 km.) of perhaps 800,000 square kilometres in between which at more than a person to the square kilometre would add about another million. The population of the whole area lying to the east of the Balkans was thus probably about five million and was probably a million or so more in the periods of outward migration in the centuries mentioned above.

The indications would tend to show a general decline in total population within the great area included in the survey. However, within the general picture there

TABLE 91

CENTRAL ASIAN POPULATION ESTIMATES

Name of area	Century	Area (1,000 sq. km.)	Population (1,000's)
West Turkestan	1st B.C.	600	600
Kirghiz-Ili	1st B.C.	400	500
Kirghiz Steppes	A.D. 10th–11th	800	1,500
East Turkestan	1st B.C.	400	300
Dingaria	1st B.C.	700	500
Central Mongolia	A.D. 6th–9th	500	500
West Altai and Upper Yenisei	A.D. 6th–9th	400	750
Total		3,800	4,650

Source: Validi, A. K., Über die Bevölkerungsdichte Zentralasien im Mittelalter, *Wirtschaft und Kultur*. Festschrift zum 70 Geburtstag A. Dopsch, 424–433, Baden, 1938.

[103] Leeper, A. W. A., *A history of medieval Austria*, 18, Oxford, 1941.

[104] Leeper, 19; Tacitus, *Ann.* II, 46.

[105] Leeper, 20–21; Tacitus, *Ann.* II, 46.

[106] Stenton, *Anglo-Saxon England*, 6.

[107] Stoll, H., Bevölkerungszahlen aus frühgeschichtliche Zeit, *Die Welt als Geschichte* **8**: 69–74, 1942.

[108] Müller-Wille, W., Zur Genese der Dörfer in der Göttinger Leinetalsenke, *Nachrr. v. d. Akad. d. Wiss. in Göttingen, Philhist. Kl.* 9, 1948.

are great differences in the trends. Actually most of the decrease occurred in western Mediterranean lands: Italy, Gaul, Iberia, and North Africa, together with Greece and Egypt. In Syria the population seems to have held even while in Gaul and Britain something like recovery must have occurred at the end of the period. Eastern Asia Minor and the Slavic area probably increased markedly. The German and Scandinavian spheres apparently held even in spite of emigration. The information about the central, eastern, and northern parts of Europe is so vague and uncertain that there may have been a considerable increase in population. The general rise in temperature should certainly have reduced the semi-glacial conditions of the northern countries and made them attractive for grain-growing groups.

VIII. NADIR OF POPULATION, 543–950

The period from A.D. 543 to 950 probably marks the lowest ebb of population in Europe since the early Roman Empire. It covers the first great attack of the plague, the worst epidemic to strike the area with which we are concerned. Following it came the Mohammedan invasions from the semi-nomadic areas of the lands surrounding the Mediterranean. From the east in the tenth century the Hungarians scourged most of Europe and what they missed was visited by the terrible raids of the Vikings from the north. Some measure of the weakness of the European population is indicated by the feeble defense put up against these invaders by the governments of Europe. Fortunately for the west, Constantinople and the Byzantine Empire held off the semi-nomadic invaders while the Franks proved strong in the west. The population data are scanty as usual in such a period and the outline of its development is more than usually uncertain.

Earlier the pattern of the epidemic years of the sixth-century plague was compared with that of the fourteenth century. There is such a marked similarity that one is justified in assuming a similarity in pattern of mortality. Thus we assume there was a 40 per cent mortality in reduction in population from that estimated for the end of the preceding period. It is probable, however, that the semi-nomadic warm and dry areas then like those today had nowhere the same mortality experienced by the more moist areas. For this reason the estimate of mortality has been adjusted with these climatic conditions in mind.

The demographic history is somewhat simplified by the concentration under several great powers. The Byzantine Empire occupied most of the east at the beginning of the period but lost out to the newly arisen power of the Arabs and their new religion of Islam. However, the Byzantine forces were still strong enough to hold off the Arabs from Asia Minor and the Balkan peninsula, two great reservoirs of manpower, which defended Constantinople as long as the great peninsulas were held. In the west the power of the Carolingian Empire controlled much of Gaul, Germany, and Italy, while the Iberian peninsula was ruled by the Ommayyad house, which by a stroke of good fortune, took over Iberia some years after it was beaten and annihilated in the east. Unfortunately, there has been little excavation of Mohammedan sites so that information about their size, except in Spain, is not so copious or so reliable as for the classical world. In general, then, the lines representing population must be less certain and subject to a wider amount of interpretation.

At the end of the period, in the ninth and first half of the tenth century, there is supposed to have been another low point in population. It seems singularly difficult to find evidence for this in most areas. In the Carolingian west, indeed, the beginning of the great upward movement appears at precisely the time when the population should have shown a marked downward trend. This is curious since it runs counter to what might be expected. The weather was certainly getting cooler in the northern area which normally should curtail production and thus cause the population to decline. It probably did this in the Scandinavian area. However, this tendency may have been offset by the striking development of technology in farming at this time: the horseshoe, the new harness and yoke, and the wheeled plow.[1] The widespread use of these was probably the cause of making the family plot smaller and thus created the base for the increase of population.

1. CALIPHATE (LANDS TAKEN FROM BYZANTINE CONTROL)

The Mohammedans created a great empire in the century following the death of Mohammed in 632 extending from Spain in the west to India in the east. Its capital, after moving somewhat uneasily among the holy cities and army camps, Mecca, Medina, Kufah, and Basrah, settled for a time at Damascus and then moved permanently to Bagdad. At the last-named places the Arab world achieved an established center which might be expected to adjust itself to the demographic forces of the caliphate. The area of Damascus, at its widest, hardly seems to have covered more than 213[2] hectares and thus in its less than a century of existence as a great capital failed to reduce such competitors as Antioch and Alexandria, not to mention the sites of the Tigris and Euphrates valleys. Indeed, the activity of the caliph as military leader in the period rather militated against the concentration of population at Damascus since the political activities were so spread out.

Bagdad became a fabulous place in the folklore of

[1] White, Lynn, Jr., Technology and invention in the Middle Ages, *Speculum* **15**: 141–159, 1940.

[2] Sauvaget, L., Le plan antique de Damas, *Syria* **24**: 314–358, esp. 331, 332 and 341, 1949.

the world. Fantastic stories were told of its vast wealth and size as well as of the numbers of its baths, bazaars, and mosques.[3] It is hard to make an estimate of its size. The area included within the Trench of Tabir, the Isa Canal, and the Tigris together with the walled area on the opposite bank was about 3,000 hectares.[4] The walled city, the round city, was only 2,400 m. in diameter and thus included about 453 hectares. Since it contained many public buildings as well as palaces and great dwellings it cannot have been densely populated. The area across the river (about 410 hectares) was heavily settled as well as the suburb between the round city and the river and another outside of the opposite gate. Much of the 3,000 hectares apparently consisted of gardens and small holdings. Under these conditions it seems very unlikely that the average density was more than 100 to the hectare, or 300,000. This still would have made it larger than Constantinople but would have been about right for an empire of 20 million inhabitants.

The population of the caliphate can be estimated only in the most tentative fashion by its several parts. About A.D. 600 as the result of the plague the population was probably lower by about 10 per cent in the drier areas [5] and may be estimated at about 4 million for Syria, 2.7 for Egypt, and 1.9 for North Africa. It might be assumed that the valley of the Tigris and Euphrates would have about the same population density as Syria and would thus have about 3.4 times that of Syria. However, that valley probably suffered the normal 40 per cent loss by the plague and would thus have about 9.1 million. To the east lies the great, sparsely settled plateau toward India. The city and territory of Merv are alleged to have had 110,000 men [6] which should give them a population of about 440,000. The territory of Merv was probably about 192,000 sq. km. which would give about two persons to the square kilometre. The table land apparently has about 1,700,000 sq. km., which at the same density as Merv would have a population of about 4.6 million. On this basis the caliphate, except for certain border areas and Spain, would number about 23 million.

Arabia	1
Syria	4.
Egypt	2.7
North Africa	1.9
Valley	9.1
Plateau	4.6
	23.3

[3] See items mentioned under "Bagdad" in the *Enciclopedia Italiana.*

[4] Le Strange, G., *Baghdad during the Abbasid caliphate,* 47, Oxford, 1924. The small number of Friday mosques would tend to favor a smaller population. *Ibid.,* 320, 324, 334. See also Muir, W., *The Caliphate,* 464, Edinburgh, rev. ed. 1924.

[5] See p. 40 for evidence that plague deals lightly with dry areas.

[6] Dennett, D. C., Jr., *Conversion and the poll tax in early Islam,* 125–127, Cambridge, Mass., Harvard Univ. Press, 1950.

Figures exist for at least two other cities in the east but they are hard to use. The city of al Hirah, seat of a pre-Mohammedan Arabic dynasty,[7] was said to have had 7,000 men of whom a thousand were ill or infirm.[8] It should have had a total population of about 28,000. It was very near the site of al-Kufah which was one of the Arabic capitals in the early Mohammedan days. It seems impossible to estimate the area of the city and its surrounding territory. In Syria the cities of Antioch, Damascus, Qinnasrin, Aleppo, and Manbij all paid a dinar a man shortly after the triumph of the Arabs in the first half of the seventh century.[9] Hims (Homs, Emesa) seems to have paid about 170,000 dinars for both the poll and the land tax.[10] Since the two taxes seem to have been about the same for many places,[11] the poll tax should have been about 85,000 representing a total for the city and district of about 340,000. Hims later became the center of one military district,[12] but the number given was probably not that of the later military district. Hims was obviously an important city but it is doubtful that its territory and population numbered less than a twelfth of Syria's land and people. It would thus seem to suggest that the population of Syria was greater than 2.6 million at the time.

Another approach to Syrian population of the eighth century can be made. An army sent to Spain was composed of divisions of 6,000 each from four military districts of Syria and 3,000 from a fifth. Thus, it is clear that there must have been a roll of soldiers of the area upon which the caliph could draw.[13] This was about A.D. 742–743. Of some years earlier is a statement of "530,500 men" whom the government had recruited and enrolled for a campaign against the Greeks.[14] The historian, writing much later, evidently confused the military roll of potential soldiers with actual army rolls. The figure is fantastic for an eighth-century army but not for a military roll of Syria from which, presumably, an army used against the Greeks would be drawn. A roll of potential soldiers certainly included the sixteen to sixty-five-year-old group but might actually include a much smaller proportion by lowering the top age limit. If the former limits existed the number would probably be multiplied by about 3.3 and give a total population of about 1,750,000. If,

[7] Hitti, P. K., *History of the Arabs,* 82–84, London, 1940.

[8] Dennett, 17.

[9] Dennett, 53–56, 58.

[10] Dennett, 55.

[11] Dennett, 86–87, 107.

[12] Zotenberg, M. H., trans. *Chronique de Abou-Djafar Mohammed ben Djarir ben Yazid Tabari* 3: 349, Paris, 1857. A fifth was set up by Yazid I (A.D. 680–683). For the districts see Hitti, map on 151. Dozy, R., *Spanish Islam,* 133, London, 1913.

[13] In the Ajbar Machmua. Lafuente y Alcántara, E., ed. *Colección de obras arábigos de historia y geografía* 1: 42, Madrid, 1867. Dozy, 133.

[14] Abenalcotia el Cordobés. Ribera, J., *Colección* (as above) 2: 133, Madrid, 1926.

however, we assume the age group to be about 16–45 it would be multiplied by about 4.5 [15] and bring a total of about 2,400,000. This leaves the problem of non-Moslems such as Christians and Jews as well as those exempt for disabilities. Since the conversion of a high proportion occurred only after about 750,[16] an estimate of 3 million would probably be reasonable for Syrian population of about A.D. 720; about two-thirds of the estimated population for Roman Syria. By the end of the century Syria probably numbered 4 million.

Some interesting figures about taxation have come down to us apparently from the ninth century. One particularly is reported by the great fourteenth-century historian, Ibn-Khaldun, as from the time of al-Mamun.[17] He reports it as the land tax. Since that tax was often associated with the poll tax and was usually about the same in amount, it is worth presenting the evidence as the two were sometimes confused by the later historians. Take, for instance, the matter of the time. Both in the time assigned and before A.D. 711, of course, Spain was not a part of the caliphate. The data about other parts, Africa and the lands to the north and east of the caliphate are missing as well as the valley of the Tigris and Euphrates (except the Sawad). In both periods the whole area east of the great valley was sometimes in the hands of a single person. If these data are found to have come from the seventh rather than the ninth century, it would probably mean that the population of Syria and Egypt was larger than is suggested by a 40 per cent decline of the population of those areas. This would help explain the rapid expansion of the Arabs in that century.

The data, especially the numbers in the first column of table 92 (land tax of the time of al-Mamun), have an interesting relationship to the population estimates for the period. If the population estimates for Egypt and Khurasan are compared with the amount of the tax in dirhems, it will be seen that the latter is approximately eight times the former: for Egypt 3 million persons and 23 million dirhems and for Khurasan 3.4 million and 28 million. For Syria the number is also remarkably close if we add the division of Hims and the four northern provinces of the Roman diocese of Syria. If these parts are 40 per cent of the total, the estimate for Syria would be 3 million persons and 24.7 million dirhems. A more difficult problem is that of the Sawad's 130.2 million in the second column. It may be the total not merely for the part of the valley known as the Sawad but for the entire valley. After all the capital was in the Sawad. Now if the proportion holds for the second column figure (130.2) in proportion as do the two figures for Khurasan (37 to 28), the figure would be 98.0. The estimate for the valley would be eight times 10.2, or 81.2 million.

[15] See p. 27, table 19.
[16] Hitti, 360.
[17] Hitti, 321.

TABLE 92

FIGURES FOR CALIPHATE TAXATION
(millions of dirhems)

Place	Land tax cash al-Mamun? 813–833	Taxes in cash and kind al Mutasim? 833–842	Taxes *ca.* 922–
al-Sawad	27.8	130.2	78.3
Khurasan	28.	37.	44.8
Egypt	23.0	37.5	
Syria-Palestine	14.7	15.9	29.8
Total	331.9	388.3	299.3

Source: Hitti, P. K., *History of the Arabs*, 321, London, 1940.

If the territory of Armenia is added the figures would be much closer.

The figure eight arouses one's interest. One might expect that the number would be four rather than eight, since the tax was upon adult men and it might be less.[18] Since the land tax and poll tax were apparently about the same, the figure might be a combination of the two. In this case we have to explain the very high total of 331.9 million which would appear to be about twice the expected total since the omitted provinces would appear to be less than the difference between the total and one-half of the 331.9. If the total is really correct then perhaps the total is that of the early days when 2 dinars (40 or 48 dirhems) were exacted in Egypt [19] and probably elsewhere. The daily wage was probably about 4 dirhems a day for a skilled worker.[20] Two dinars would be the pay for a week, a heavy but not excessive tax.

For Egypt the only direct information is that Barqah, capital of the Pentapolis, was to pay 13,000 dinars for the area of the Pentapolis [21] in the early period of the Arabian conquest. Since the tax was usually a dinar to the male it should show a total for that area of only 52,000 Christians. There were probably few Mohammedans at the time. When Alexandria was captured by Amr in 642 he ecstatically claimed that it had 4,000 palaces, 4,000 baths, 400 theatres, 12,000 sellers of green vegetables, and 40,000 tributary Jews.[22] Now the Arab wall constructed about A.D. 811 surrounded only about 300 hectares.[23] For that size in a badly contracted city, the total population can hardly have been over 45,000 and may have been less. It was still the metropolis until Fustat and later its neighbor, Cairo, became the capital of the country. Cairo at

[18] See p. 33.
[19] Hitti, 164. The amount for Syria was apparently one dinar with a measure of wheat a head (*ibid.*, 150).
[20] The slave who killed Caliph Omar objected because he had to pay his master two dirhems a day. The caliph thought that it was not too high for a skilled carpenter and metal worker. Muir, W., *The caliphate*, 188, Edinburgh, 1924.
[21] Dennett, 92, 94, assuming the tax was one dirhem a male.
[22] *JRS* 31: 17–18, 1941.
[23] East, W. G., *An historical geography of Europe*, 27, 195–197, London, 3rd ed., 1948.

the time (A.D. 969) had only about 176 hectares [24] and even with Fustat and Old Cairo probably had less than 300 hectares. The cities suggest a total population of Egypt of about 3 million in the ninth century; as a result of the plague its population was probably about 2.7 million at the time of the Arab conquest,[25] as high as it was early in the nineteenth century.

Caliph Omar is known to have exacted 2 dinars an adult male head and some produce from the Egyptians.[26] He is said to have received 14 million dinars, a fantastic sum since the whole taxation of Egypt about A.D. 854–857 was less than 3 million. However, if dinar is a mistake for dirhem (worth about a tenth of the dinar at the time and therefore easy to confuse) the sum represents the amount paid by 700,000 men. Multiplying this by three to get the total would bring about 2,100,000 persons, not far from the previous estimate.

The Arabs took over Byzantine North Africa with little trouble. In their language it became El-Maghreb (the west) and tended to revert to semi-nomadism. It had had a surprising number of Christian bishops in the later Byzantine era,[27] some 465. With the Arabs' attacks and capture, the decline precipitated by the plague seems to have continued. Timgad disappeared in A.D. 647 and Carthage about 698. Some new cities appear, notably Kairwan and Tunis. Since the former had only about 38 hectares and the latter about 97, it is hard to envision a total population of the area of more than a million.[28] However, this may be an underestimation since under the Aghlabids the area apparently prospered in the period A.D. 850–950.[29]

Iberia, by 543, was probably down to 4 million inhabitants. The plague should have reduced it to about 3.6 million before recovery set in. The Visigoths under Leogild selected Toledo as a capital about the year 569; it was already the ecclesiastical center of Iberia. Under such auspices the city might be expected to become a metropolis for the entire peninsula. The new cathedral of St. Mary was dedicated in 625 [30] and at about the same time Bishop Isidore's celebrated eulogy of Spain gives an impression of recovery and even of prosperity.[31] King Wamba (672–680) rebuilt the walls of the city of Toledo.[32] Yet the city was built in a very circumscribed location so that it is unlikely to have been larger then than it was in 1594 when it had a population of about 41,000.[33] It had about 114 hectares of area. At 1½ per cent of the total, Toledo could hardly have been the center for a population of more than 2.8 million. However, the Visigothic regime may have been too loose to have drawn away from such centers as Cartagena and Córdoba.

The Moors brought Iberia within the economy of the widespread caliphate where its wealth of mineral resources would be valuable. It also created a more centralized and more highly developed political organization. Under these circumstances a continuation of the earlier recovery might be expected. Fortunately, there are some data which give information about the country since the poll tax was paid here as elsewhere. It was 48 dirhems a year for the rich, 24 for the middle class and 12 for those who lived by manual labor.[34] It was paid by non-Mohammedan men but among the exempt were monks, cripples, blind, sick, and slaves. In the time of al-Hakim (796–822) a levy of this tax (together with two small taxes) was made of which the following figures remain: [35]

	dirhems
Córdoba (p. 251)	142,000
Morón (p. 227)	21,000
Niebla (p. 203)	15,600
Seville (p. 252)	35,100
Sidona (p. 124)	50,600

The three together made up the *gibaya:* besides the poll tax were the taxes for exemption for military service and on falconry.

Another number assigned to Spain of the time of al-Hakim is that of Córdoba, 113,000 houses: [36] its size is obviously for the whole province rather than for the city and its suburbs as stated. After all, as Lot has shown, the city recently had only 73,000 inhabitants and is larger than the medieval city—even if its suburbs were greater then it could hardly have numbered more than 100,000.[37] The 113,000 houses correspond nicely with the figure of 142,000 dinars, and even better with the statement that the tax (which we assume to be the poll tax alone) was 110,020

[24] *Encyclopaedia of Islam* under "Cairo."

[25] But see East, *op. cit.*, quoting Awad, M., *Publication of the International Geography Congress,* 330, 1927 and El-Darwish, *Population* 1: 43, 1934.

[26] Von Kremer, A., *Culturgeschichte des Orients unter den Chalifen* 1: 61, Vienna, 1875. Amr ibn Asy suggested that the country paid 8 million dinars.

[27] Beloch, *BGRW,* 470. If Tripoli is included there were 470 bishops.

[28] *Encyclopaedia Britannica* under these cities.

[29] Estimating from modern military maps in the National Library of Wales, Aberystwyth. See also Lewis, E. A., *Naval power and trade,* 164, Princeton, Princeton Univ. Press, 1951.

[30] Madrid, Archivo Nacional, *Legajo 7215* for a copy of the inscription.

[31] *España Sagrada* 6: 473.

[32] *Speculum* 27: 8, 1952.

[33] *Censo de población,* 70.

[34] Dozy, R., *Spanish Islam,* 235, London, 1913 quoting from *España Sagrada* 2: 523. Hitti, 171.

[35] From the description of Spain by al-Bakri in Lévi-Provençal, E., ed. *La peninsule ibérique—al-Himyari,* 251, Leiden, 1938. The citations for particular places are given after the name of the city in the text. In addition (*ibid.,* 139) the number for Santarem is given as 2,900 dinars. It lies in modern Portugal.

[36] Sánchez-Albornoz, C., *La España Musulmana* 1: 343, Buenos Aires, El Ateneo, 1946. See also in app. 334.

[37] F. Lot, *Invasions barbares,* 19.

dinars.[38] Here we can assume probably that the middle class, paying twice the working-class tax, numbered about half of the working class and thus paid about the same sum. This would then assume a non-Moslem population in the province of about 82,515 and a Moslem population of about 27,505.[39] The city itself is said to have had respectively 3,750; 6,087, and 13,750 slaves, and to have eaten 13,000 pounds of meat daily without counting poultry or fish.[40]

If in the other districts the relation of dinars to houses is about 142,000 to 113,000 (or about 80 per cent) there should be about 211,440 houses in the five districts given above. At four persons to the house this would give about 846,000 persons in these districts. They probably included about two-thirds of the Roman province of Baetica in the early Empire which is estimated to have had about 1,800,000. Probably then Spain in the time of al-Hakim had about 4 million. This would fall in line with a curious figure given by a chronicler: the 4,030,000 dinars which Musa had to pay for his temerity in conquering Spain without the caliph's permission.[41] It was said that much of it came from the capitation of the non-believers. Musa had time to collect about three years' tax (A.D. 712, 713, 714) before he suffered the penalty. If one million each paid a dinar a year for three years, the sum would be three million which might well be described as much of four million dinars. The element of guess is very large here, of course. Córdoba, assuming the Christian states of the north numbered half a million persons, by the time of al-Hakim would be the capital for 3.5 million people, and should have a population of over 50,000. Its 156 hectares within the walls and extensive suburbs outside would care for these and its great mosque could hold a good part of the men.[42]

However, the three estimates of slaves, unless they are guesses, indicate that the area of Córdoba was growing rapidly in population in the period. There are some clues which show that Córdoba was probably much larger in the time of al-Mansur (981–1002). The number of mosques is stated to have been some short of 500.[43] Then there is the statement that in a count of houses there were some 213,077 for ordinary persons and 60,300 for the upper classes, giving a total of 273,377 for the province. To these data are added the statement that merchants numbered 80,000. All of this would show a considerable increase in the population of the city and province so that the total at 3.5 to the house would be 956,820. The index 3.5 is chosen because the number of buildings includes all types, even public buildings. The population of Córdoba would thus be about twice that of the time of al-Hakim. This would give all of Spain, if it increased proportionately a population of seven million, making allowance for the devastation of the frontier between the caliphate and Christian Spain. It would make the caliphate the most populous division of western Europe, probably more than the empire of the Carolingians except in the palmiest days of Charlemagne. However, in the tenth century the caliph of Córdoba included in his empire a part of North Africa. This empire then would run somewhere above 7 million.

TABLE 93

SIZE OF CITIES OF MOHAMMEDAN SPAIN

	City	Area in hectares	Estimate of population (thousands)
1	Córdoba		90
2	Seville	225	52
3	Almeria	118	31
4	Cartagena	110	29
5	Toledo	106	28
6	Jerez de la Frontera	96	24
7	Mallorca—Palma	90	23
8	Badajoz	81	21
9	Granada	75	20
10	Murcia	65	17
11	Zaragossa	47	12
12	Valencia	44	11
13	Malaga	37	10

Sources: estimates of area for 5, 7, 9, 11, 12, and 13 come from: Torres Balbás, L., *Studia Islamica* **3**: 55–56, 1955. Estimate of 175 sq. m. for average habitation, *ibid.*, 49–53. Area of 2, *Al-Andalus* **18**: 181, 1953. 7, *ibid.*, estimated from map on 166. 6, Baedeker, *Spain and Portugal*, 427, 1913. Others from modern maps.

The cities of Mohammedan Spain have been studied by L. Torres Balbás (table 93) who believes that the average city holding was about 172 sq. m. This gives 58 to the hectare. He accepts 6 persons to the holding, but (table 55) 5 for Seville and 4.5 for others seem more probable. These calculations give 290 and 261 persons to the hectare, still large but acceptable when one considers the gardens about these cities. The area is that of the walled enclosure but several had settlements of some size outside of the walls, notably Valencia and Zaragossa, and should probably rank higher in the list.

2. THE BYZANTINE EMPIRE

The population of the Byzantine Empire has been the subject of a study which illustrates well how scarce

[38] Sánchez-Albornoz, *op. cit.* **1**: 341. It also paid 4,700 *almudes* of wheat and 7,747 of barley and other grains. The 142,000 dinars were accompanied by payment of 53,000 bushels of wheat and 73,000 of barley, also in the time of al-Hakim.

[39] Assuming that the wealthy class was so small among the Christians and Jews as to be negligible.

[40] Menéndez Pidal, R., *Historia de España* **4**: 330–331, Madrid, Espasa Calpe, 1950.

[41] Abenalcotia el Cordobés, Ribera, J., ed. *Colección de obras arábigas de historia y geografía* **2**: 142, Madrid, 1926.

[42] At its full extent probably about 45,000 square metres.

[43] Sánchez-Albornoz, *La España Musulmana* **1**: 340–343. Its area including al-Zahra and al-Zahira is alleged to have had a perimeter of 12,400 metres which could have included a thousand hectares. Begué, E., *La alta Edad Media*, 69, Barcelona, 1953. Córdoba had many unwalled suburbs. Torres Balbás, L., *Al-Andalus* **18**: 163–165, 1953.

is the information about it.[44] However, the area of the empire at different times has been estimated and shows clearly the extent of the loss to the Arabs.[45]

A.D. 422	745,000 sq. km.
560	1,010,000
770	405,000
959	420,000
1024	545,000
1180	390,000

More interesting indications are provided by a study of forms of taxation which would indicate serious depopulation in the early period, followed by rising population in the seventh to eighth centuries and even overpopulation in the tenth century.[46] Although the empire had a poll tax for much of the period, no records seem to have survived which throw light on the population.

Constantinople was a very great city at the beginning of the period. Yet even at its height in the tenth century the area between the two great walls was but sparsely settled [47] so that the 640 hectares of Constantine's city really enclosed the well-inhabited area. If 300 a hectare (a very high index) is permitted, the city would have had about 192,000 persons at its height under Justinian. That emperor is alleged to have given the city 8 million of something of grain.[48] At an *artaba* a month per person (assuming that the something was the *artaba*) this would be sufficient for about 670,000 persons, much too high. If it were the smaller measure (*modius*) which would be about a loaf a day of quite small size, it would feed about 160,000 persons. If it were 8 million loaves, it would only be enough for about 22,000 persons. Assuming the number is accurate, it would seem that the number refers to *modii*. If Constantinople had about 160,000 it should have been the metropolis for about 10.7 million, a fair estimate for Asia Minor and the Balkans including Greece about A.D. 600. It apparently did not disturb the position of Alexandria and Antioch even though Justinian's position was so strong. The city, as Procopius states so vividly, was terribly injured by the plague.[49]

Italy was divided during most of the period between the Byzantine Empire and other powers, Lombard, Carolingian, or independent. The sixth-century plague probably reduced its numbers to less than 3 million by the year 600. No data seem to throw light upon the population then. An attempt has been made to show that Naples in the period had about 35,000.[50] Certainly some of the loss of the cities on the Roman roads was due to flight to those picturesque hill town sites which are still so characteristic of Italy. However, signs of economic revival have been noted definitely at the end of the eighth and at the beginning of the ninth centuries.[51] At least a part of the increase may have been cancelled by the Hungarian invasions and other disturbances of the ninth and early tenth centuries.[52] The revival may have been especially marked in the south if we are to believe that Palermo (even with fugitives from its countryside) had anywhere near the 70,000 reported in the siege of 831.[53]

The size of the leading cities does not suggest an Italian population of greater than 4 million in the second half of the period. The city of Rome, as the holy city of western Europe, was described by travelers in more detail than other places. It was divided for military purposes into two districts and the Trastevere, a system which differed markedly from the earlier sets of divisions, being more heavily concentrated in the old center, the southeast of the Campius Martius and Trastevere.[54] From the description of tenth-century Rome, apparently only about 300 of its 1,380 hectares within the walls were settled. At 100 to the hectare the population was probably not over 30,000, metropolis for a population of about 2 million, but part of the people depended upon ecclesiastical income from even outside of Italy. Pavia, the Lombard capital, had only about 61.5 hectares and a population of not more than 12,000 even if thickly settled and with suburbs.[55] Ravenna, center of the exarchate, was about 120 hectares in size with perhaps 15,000.[56] The relation of these and other cities to Italy of that period will require more study.

The estimate of less than 4 million for Italy receives some corroboration from data of the sixth to seventh centuries which give size of holdings and numbers of families and persons of several places in that country. Now the data are somewhat disparate as one can see, yet other evidence would show that the Cortenova

[44] Andreades, A., La population de l'empire byzantin, *Actes du IVe Congrès International des Études byzantines,* 117–126 Sofia, 1935.

[45] *Ibid.,* 124.

[46] Ostrogorsky, G., Die Steuersystem in byzantinischen Altertum und Mittelalter, *Byzantion* **6**: 233, 1931.

[47] *Camb. Med. Hist.* **4**: 749–750.

[48] Bratianu, G. I., La question de l'approvisionnement de Constantinople, *Byzantion* **5**: 88, 1929–1936.

[49] Procopius, *Wars,* II, 24.

[50] Pardi, Napoli attraverso i secoli, *N. R. S.* **7**: 474, 1923. This is objected to by Schipa, M., Intorno alla popolazione di Napoli nell' alto medio evo, *Proceedings,* Rome 627–633.

[51] Mengozzi, G., *La città italiana nell' alto medio evo,* 83, 144, 171, Florence, 1931.

[52] Fasoli, G., *Le incusioni ungare in Europa nel secolo X,* Florence, G. C. Sansoni, 1945.

[53] By Ibn-al-Atir. Vasiliev, A. A., *Byzance et les Arabs* **1**: 359. Only three thousand are alleged to have survived the siege.

[54] Gregorovius, F., *Geschichte der Stadt Rom im Mittelalter* **3**: 509 ff., Stuttgart, 1904. It was increasing in size in the tenth century. *Ibid.,* 552.

[55] Information furnished by Professor C. M. Cipolla. For references to the very populous and prosperous state of the city see his Profilo di storia demografica della città di Pavia, *B. S. Pavese* **5**: 89, 1943.

[56] Estimated from map in Baedeker, *Italy,* 302, 1879. This assumes less density than at the height of Ravenna's career in the sixth century.

TABLE 94

EARLY MEDIEVAL ITALIAN DATA

Place	Number of *iuga*	Number of families	Number of persons
Cortenova	2,287	7	18
Covello	55	1	5
Fara	22	1	5
Barbata	191	5	41
Vedelengo	52	1	6
Pumenengo	47	3	8
Andengo	400	1	2
Total	3,054	19	85

Source: Salvioli, Sullo stato e la popolazione d'Italia prima e dopo le invasioni barbariche, *Atti della R. Accademia, Palermo*, ser. 3, **5**: 70, 1899, from *Cod. Dipl. Long.* no. 464. Other interesting data of similar character on 71–73.

situation was more typical of Italy, which was apparently heavily wooded then,[57] than of the other places. The data above give one person to each 35 *iuga* or about 9.1 hectares. If this ratio held true for all of Italy's 29.6 million hectares, the population would have been about 4 million. Since Cortenova's situation probably represents a more normal density than the others, the 4 million would probably be an overestimation of the actual population; the population may well have been 3 million or less in the period.

3. THE CAROLINGIAN EMPIRE

The organization of the Frankish state was the work of a series of rulers from the fifth to the ninth centuries. By the time of Charlemagne that state included all of Roman Gaul, much of Germany, part of Italy and some other central European territory. There were drawn up then a number of polyptyques which throw some light upon demographic conditions in limited areas. They fail to do much for the general state of total population. Some evidence also appears in the number of places and the size of cities but its interpretation is difficult. One can begin, of course, by assuming that the sixth-century plague reduced the population by about 40 per cent.

Some of the best information about population in the whole Middle Ages comes from the so-called Polyptyque d'Irminon. Irminon was abbot of the Parisian house of St. Germain des Prés by 811 and was apparently dead by 819. Thus, the collection of data fell during the last few years of Charlemagne and/or during the first years of Louis the Pious.[58] The survey lists all of the persons in the lands of the abbey, giving the names of all except some children. In addition it gives a very exact description of the nature of the holding. From the evidence a good deal can be deduced from items scattered in it. Under Irminon part of a marsh and an island were reclaimed and put into cultivation.[59] It would then seem that the population was increasing in this period. There are distinct problems with rather unusual names: in general it has been assumed that names ending in *us, om, eo, ms, bert* are masculine while those ending *a* and *ls* are feminine. Fortunately the gender is stated in many cases.

The evidence from the Polyptyque d'Irminon produces some peculiar results if it is presumed to be representative of all of Gaul at that time. The lands of the Abbey cover about 35,012 to 38,141 sq. km.[60] The number of individuals living on this area was about 10,282 or 26 to the sq. km. If all Gaul with its 590,000 sq. km. had the same population density as the abbey lands, it would have held about 15 million. If the population is considered by parishes, the average parish seems to have consisted of about 67 ménages (table 95) as compared to the 1328 average of 100 hearths. By this comparison Carolingian Gaul should again have had about 15 million. Since Gaul then had nowhere near 15 million, the population must have increased by colonization of villages rather than by increase of size of villages established in Carolingian times.

There are some deductions which may be put forward tentatively. It is likely that there were at some time as many ménages as *mansi*. Thus, there must have

TABLE 95

NUMBER OF HOUSEHOLDS IN SOME CAROLINGIAN PARISHES

Parish	Ménages	Parishes	Guerard I, p.
Palaiseau	180	2	828
Celles-les-Bordes	81	2	831
Gagny	40	1	833
Nogent	38	1	841
Boissy	210	3	856
Thiais	144	1	859
Villeneuve-Saint-Georges	144	1	861
Combs-la-Ville	101	2	864
Morsan-sur-Seine	48	2	866
D'Émant	107	1	868
Villa supra Mare	42	1	871
	1,135	17	

[57] Salvioli, G., Sullo stato e la popolazione d'Italia prima e dopo le invasioni barbariche, *Atti d. R. Accademia, Palermo*, ser. 3, **5**: 70, 1899 from the *Cod. Dipl. Long.* no. 464. See also *ibid.*, 71–73 and Salvioli, *op. cit.*, 49.

[58] Guérard, B., *Polyptyque de l'Abbé Irminon*, Paris, 1844; Longnon, A., *Polyptyque de l'Abbaye de Saint-Germain des Prés*, Paris, 1886–1895.

[59] Guérard, *op. cit.* **1**: 10–13.

[60] Lot, F., Conjectures démographiques sur la France au IXe siècle, *Le Moyen Âge* **32**: 10–11, 1921. Lot's suggestion that children under twelve or thereabout (p. 18) were two to the family seems a mistake. It was about 1.5. See a case where such a situation is definite at the Abbey of S. Remi. There the children and parents, both *perfectae aetatis*, are 47 families to 74 children. Guérard, B., *Polyptyque de Saint-Remi de Reims*, 54–56, Paris, 1853.

been a 70 per cent increase (from 1,646 *mansi* to 2,788 ménages)[61] sometime since the bottom of the decline resulting from the plague. Since that has been estimated for Gaul at about 3 million, if the abbey lands are typical, the population for Gaul must have returned to at least 5 million. The 3.6 average numbers of persons to the ménage also suggests that the population was increasing. On the other hand the cities do not seem to be over-running their late Roman walls which we should certainly expect if the increase was general up to and beyond the 6 million estimate of the late Roman period. However, one difficulty is that the most rapid colonization appears in the northern parts where it is difficult to form a basis of comparison. In the Moselle there was a notable advance in colonization even in the ninth century.[62]

Unlike the other great powers of the time the Carolingian Empire had no outstanding central city. Charlemagne, for instance, preferred to stay at Aachen or Nimegue (Nimwegen), neither of which was other than a recreational center. The government was personal rather than institutional and thus tended to ambulate with the emperor rather than to institutionalize itself in one place. However, the case for a relatively small population for that part of the Carolingian Empire west of the Rhine is improved by two lines of argument: an examination of the tribute paid to the Normans in the ninth century and Lamprecht's study of the rise of towns in the Moselle Valley.

The tribute paid by the Carolingian emperors in A.D. 877 was 5,000*l* or 1,200,000*d*.[63] To pay this the areas of France (about 62,000 sq. km.) and Burgundy (about 44,000 sq. km.) were to pay for each signorial manse 12*d*, for each free manse 8*d*, and for each servile manse 4*d*. The number of the servile manses was small, perhaps only a seventh of the total, so that the average would be about 8*d*. Others paid but they were few in number and might have averaged also about 8*d*. This then would give about 150,000 manses (or their equivalent) for the area. At about 6 to the manse[64] the population would be about 900,000 for the 106,000 sq. km. Since the area of Gaul was about 590,000 the 900,000 should be multiplied by 5.6 which gives 5,040,000. If one takes the Danegeld of 866 as a basis (that is, 4,000*l* divided by 6*d*) the result is not much different.[65]

In his well-known study of Moselle villages, Lamprecht assumed that the average size of the villages increased greatly in the period A.D. 800–1300. Lamprecht states that 35 to 40 places had Roman names and about 120 had Celtic ones. These with the number of places appearing before A.D. 800 with German names gives about 340 villages at that time (table 96). He would have the average size of the village increase from about 20 at that time to over 250 in the thirteenth century. Now the data in regard to the St. Germain parishes (table 95) show that the population of the parishes about 800 was nearly two-thirds of what it was to be in 1328. Thus the increase in number of places would not differ greatly from the actual increase in total population. This can be seen in table 96 in the comparison between the population of England and the number of Moselle villages in the period. Here the population increased faster before 1086 than in England and more slowly thereafter—which was to be expected. If the French advance from 971 (after the Norman invasions) increased as did the English, the area west of the Rhine should have had about 6 million in the tenth century.[66]

TABLE 96

APPEARANCE OF MOSELLE VILLAGES

By year	Number of villages	Ratio using 1086 number as 1.1	Population of England (millions)	Estimated average village pop.
800	340			20
856	415	.52	.7	
900	490			60
981			.9	
1000	590			80
1050	710			100
1086	790	1.1	1.1	
1100	830	1.2	1.3	140
1150	1050	1.5	1.6	180
1200	1190	1.7	1.9	220
1237	1380	1.9	2.2	250

Source: Lamprecht, K., *Deutsches Wirtschaftsleben im Mittelalter* 1: 150, 163, Leipzig, 1886. He gives the number of new villages and total German villages. The estimate of number is mine, as is the estimate of English population.

4. NORTHERN AND EASTERN EUROPE

The northern and eastern areas have a certain amount of evidence for this period but it is small in volume. Probably the best evidence is for England. The German situation is not clear. East of the Rhine there were, of course, the great tribes which fought Charlemagne. The advance in population which we have seen in the Moselle Valley proceeded more slowly across the Rhine.[67] It is possible that adding Scandi-

[61] Guérard, *Polyptyque de l'Abbe Irminon* 1: 897.

[62] Lamprecht, K., *Deutsches Wirtschaftsleben im Mittelalter* 1: 153; 2: 23.

[63] For study which presents the evidence but comes to a different conclusion see Lot, F., Les tributs des Normands, *Bibl. Ec. Chartes* **85**: 58–78, 1924. It does not seem necessary to believe that only the clergy held honors.

[64] The figure for the land of St. Germain des Prés.

[65] That is, 960,000 divided by 6. See Lot, *op. cit.*, 76 for data. The Danegeld was for other sums at other times (seven thousand pounds in 845, six in 862 and twelve in 884) but the basis for the exaction is not given.

[66] 24.6 million divided by 4.1.

[67] The area about Göttingen is supposed to have had a density of about thirteen to the square kilometer about A.D. 800. Müller-Wille, W., Zur Genese der Dörfer in der Göttinger-Leinetalsenke, *Nachrr. v. d. Akad. d. Wiss. in Göttingen*, 10, 12, 1948.

TABLE 97

THE TRIBAL HIDAGE

Hypothetical Kentish original about A.D. 590			Mercian Revision about A.D. 740		
Tribe	Number of hides		Tribe	Number of hides	
Cantwarena	15,000		Mercia (subtotal)		30,000
Suth Sexena	7,000		Wreocensaetna	7,000	
			Westerna (Westan Hecana)	7,000	
Sudrica	3,500		Pecsaetna	1,200	
Sunninga	1,200		Elmed saetna	600	
Aro saetna	600				
Faerpinga	300		Lindesfarona mid Haethfeld land	7,000	
Bilmiga	600				
Wideriga	600		Suth Gyrwa	600	
East Willa	600		North Gyrwa	600	
West Willa	600		East Wixna	300	
(subtotal)		30,000	West Wixna	600	
			Spalda	600	
East Engle	15,000				
East Sexena	7,000		Wigesta	1,800	
			Herefinna	1,200	
Ciltern saetna	4,000		Sweord ora	300	
Hwinca	7,000		Gifla	300	
			Hicca	300	
Ex gaga	5,000				
Uwch gaga	2,000		Wiht gara	600	
Westerna	7,000		Hex or Nox gaga	5,000	
Wreocensaetna	7,000		Oht gaga	2,000	
Pec saetna	1,200				
Elmed saetna	600		Hwinca	7,000	
			Ciltern saetna	4,000	
Lindisfarona mid Haethfeld land	7,000				
			Hendrica	3,500	
Suth Gyrwa	600		Unecungga	1,200	
North Gyrwa	600		Aro saetna	600	
East Wixna	300		Faerpinga	300	
West Wixna	600		Bilmiga	600	
Spalda	600		Wideriga	600	
			East Willa	600	
Wigesta	1,800		West Willa	600	
Herstinga	1,200				
Sweordora	300		East Engle	30,000	
Gifla	300		East Sexena	7,000	
Hicca	300				
			Cantwarena	15,000	
Wiht gara	600		Suth sexena	7,000	
	100,000			100,000	

Variants. Pec saetna 600 L. Suth Gyrwa 6,000 L. North Gyrwa 6,000 L. West wixna om. L. Wigesta 900 E, 800 L. Herefinna 602 L. After 'Oht gaga E gives 66,100. Hendrica 3,000 L. After "Suth sexena" E gives West sexena 100,000; 242,700 while L gives two totals 100,000; 200,700.

navia to the German lands the total may have been 4 million at the end of the period. The Slavic lands to the east saw a considerable advance in the period. It was, indeed, a golden age for the Russians.

Mainz was a reasonably important city and should give some indication of German population. It has been estimated that there were 50–60 free families living there at one time in Carolingian days[68] by references to gifts to Fulda and other monasteries described as being next to other free persons. Then Charlemagne gave to Fulda an area including 25 *mansi* (probably of the free), 66 unfree, and 16 half-free.[69] Lorsch had 45 acres, 7.5 *mansi*, and 31.5 *iurnales*,[70] while Fulda apparently had several hundred unfree

[68] Rietschel, S., *Die Civitas auf deutschen Boden bis zum Ausgange der Karolinger Zeit*, 78, Leipzig, 1894, Ausgewählte Doktordissertationen der Leipziger Juristenfacultät, 1.

[69] "In Mogontia civitate mansos xx et v et mancipia lxvi et xvi lidos et vineas ad ipsa beneficia pertinentes." From Dronke, E. F., *Codex Diplomaticus Fuldensis*, 31, Cassel, 1850. Quoted by Rietschel, 82.

[70] Rietschel, 85 quoting *Mon. Germ. Hist.* SS **21**, 343.

TABLE 98

COMPARISON OF POPULATION, SOME TRIBAL HIDAGE AND DOMESDAY AREAS

Area	Tribal Hidage		Domesday Book population estimate
	Hides	Population estimate	
East Anglia	15,000	60,000	168,000
East Sexena	7,000	28,000	56,000 (Essex)
Hwinca	7,000	28,000	41,000 (Warws., Worcs.)
Kent	15,000	60,000	48,000
Lindisfarona	7,000	28,000	90,000 (Lincs.)
Surrey	3,500	14,000	15,925
Sussex	7,000	28,000	42,000
Westerna	7,000	28,000	20,000 (Herefs.)

Sources: table 97 for Tribal Hidage and Russell, *BMP*, 53–54 for Domesday data.

there [71] and the laity held many also of the latter.[72] Already five churches were mentioned.[73] Nevertheless, the city was still so small that street names were not used and the names of neighbors usually sufficed to indicate position in the city.

The possibility of discovering information about England of this period centers about the value of the ancient document known as the Tribal Hidage (table 97). In its present form it is a Mercian document of about A.D. 750. However, an effort has been made to show that it is a reshaping of a Kentish document of about A.D. 590 and is of value in showing the status of England at that time.[74] This was, as will be remembered, some forty years after the beginning of the Black Death which seems to have affected England as it did other countries. Usually such groupings as that of the hide (defined as the holding of one family) reached a maximum and then remained static until increased beyond the original limits. That is, we might expect the limit to have been reached just before the Black Death when England was regarded as reaching a population limit [75] and to have remained static then until it had recovered its original population after the plague.

If we compare the number of hides allotted in the Tribal Hidage and the population suggested by them (four to the hide) with the population of Domesday we have a means of comparison for these two times (table 98). Only two sections seem to have had a larger population about 590 than they did in 1086. Even in the case of Westerna (Herefordshire) is it likely that the area extended far into Wales since the western Hecana were probably in part a Celtic tribe (Iceni).[76] It is doubtful that Kent was much more populous in 590 than it was in 1086 so perhaps 3.5 persons to the hide was probably sufficient for 590. This would indicate that the population of Kent before the sixth-century Black Death was about 60,000 and included the short, dark folk as well as the Anglo-Saxons. These then will be the premises employed in regard to the entire Tribal Hidage.

The number of hides for England of about 590 we set up as follows:

Tribal Hidage (minus Gagas)	93,000
West Saxons	17,000
Northumbrians	15,000
	125,000

The number assigned to the West Saxons is about the number appearing in the much later Borough Hidage in the area of the West Saxons.[77] This number is about the size necessary for them to have fought the Kentish and associated areas with some degree of success. The number assigned to the Northumbrians assumes that they are not much less in numbers and power than the East Angles and Kent. By the end of another generation after the decline of East Anglia they were the dominant group within England. Multiplying 125,000 by 3.5 would give a total of about 437,500. Somewhere between this figure and a half million would be a fair estimate. It is thus more than double the 200,000 estimated as the population for England after the departure of the Roman army from the island. If we assume that about 100,000 are the short, dark folk, the number of Anglo-Saxons would be about 337,000–400,000. If even 200,000 Anglo-Saxons came over in the migrations of about 440–470, they doubled the number of the free, fighting Celts. It requires no recourse to the supposed virtues of the Saxons or the wickedness of the Celts to see why the latter were driven out.[78]

Assuming that the bottom of population was reached about A.D. 600, the rise can have been immediate. Bede writing about 700–735 gives certain clues about what was happening to population. He states that the number of hides of the South Saxons is 7,000, the same as in the Tribal Hidage. However, he doubles the number for the Isle of Wight from 600 to 1,200. Instead of the Wreocensaetna and Pecsaetna for which the Hidage gives 8,200, Bede presents the two branches of the Mercians with a total of 12,000.[79] The implications are clear if not very numerous. Sussex was in a territory which was already well settled by 543 and

[71] Rietschel, *op. cit.*, 86.

[72] *Ibid.*

[73] Rietschel, *op. cit.*, 84. The saints are Mary, John, Peter, Clemens, and Theonest.

[74] Russell, J. C., The Tribal Hidage, *Traditio* **5**: 192–209, 1947.

[75] Stenton, F. M., *Anglo-Saxon England*, 4–8, Oxford, Clarendon, 1943.

[76] Russell, J. C., Westerna in the Tribal Hidage, *Notes and Queries* **194**: 228, 1949.

[77] Maitland, F. W., *Domesday Book and beyond*, 505. By counties 3,520 for Hampshire, 5,600 for Wiltshire, 3,360 for Dorset, and 4,813 for Somerset.

[78] As suggested by Hodgkin, R. H., *History of the Anglo-Saxons* **1**: 178–183, Oxford, 1939.

[79] Bede, *Hist. Eccl.*, IV, 13; IV, 16 and III, 24 respectively.

thus had not increased. Wight and Mercia had not only recovered their original population but had increased well beyond the 543 figures. Probably then by 735 the population of England was about a half million and still increasing rapidly. This period of increase may have been halted by the Danes in the ninth century and been resumed in the prosperous days of the tenth and early eleventh so that it was reaching for the 1.1 million which appear in Domesday.

The population of England in the middle of the ninth century may possibly be estimated from the amount of Peter's Pence or Romescot which became traditional in England in the Middle Ages. The sum was 199*l* 6*s* 8*d* which, at a penny for each family, represents 47,840 families. The tradition is that an Anglo-Saxon king, Ine or Offa or Ethelwulf, agreed to the payment at the rate of a penny the family.[80] Now such a tradition might be attached easily to the name of either Ine or Offa on the ground that both were powerful kings who had gone to Rome. On the other hand, Ethelwulf was only a moderately great king: on critical grounds he seems preferable. Furthermore, the payment can be detected in the next reign so that such a gift is understandable from historical sources. If we may assume that the gift was originally based upon families of some substance, then the number of persons should be multiplied by 6,[81] which gives a total of 287,040. If the kingdom of Wessex was constituted as it was in 856 when Ethelwulf went to Rome, the number may be compared with Domesday population of the same counties for an estimate of the whole country. This estimate is 432,958 [82] or about 66 per cent of the Domesday population. The total population of England would have been about 726,000 at the time. The severe conditions of the Danish invasions for the next half-century probably prevented any increase in English population and helped crystallize the payments (heavy in any event) at that peculiar figure.

The population of Wales may be estimated crudely from two indications. The Tribal Hidage gives the number of hides for the Gagas as 7,000. Presumably they were the most populous of the three tribes there (Demetae and Gwynedd being the others). If we assumed 3.5 persons to the hide the Gagas would have about 24,500 persons and the three tribes of Wales about 73,500 people. The Celts of Dumnonia would add another 25,000 and bring the total Celts south of the Mersey to about 100,000. Another approach is through the number of cantrefs in Wales whose number was fifty. Now Bede says that the Isle of Anglesey had more than 1,200 hides.[83] Since there were three cantrefs on the island, each cantref should have about 400 hides or 1,400 persons.[84] Fifty cantrefs then would give about 70,000 persons. However, since Anglesey was the most prosperous part of Wales, an estimate based upon it should give the highest estimate of population.[85]

In the great areas of central and eastern Europe the most important demographic development of the period was the great expansion of the Slavs. They press along the borders of the empire during the sixth-century epidemics of the great plague,[86] and seem to fill the Balkans in succeeding centuries. Similarly they moved into central Germany filling an apparent vacuum left by the German tribes as they migrated. They also extended their settlements into the Russian areas a little later. To some extent they were being shoved about by more warlike groups but they must, nevertheless, have increased vastly in numbers. The actual population is difficult to estimate although, as long as they were subjected to constant raids, their agricultural life was probably limited and the population rather scant. Even granted this, one wonders over how large a territory a raiding party could pillage effectively and how much could be taken by such parties any distance. Were there rules of the game which defined what part should be stolen each year and thus be a rough form of taxation? How thick would the forest cover have to be to hide in? [87]

This period saw the rise of a strong state centred in Bohemia under a Slavic merchant named Samo.[88] This rather ephemeral state was strong enough to hold off the Avars on the south and the Franks on the west. Even granted that distance was on its side, the Slavic state must have numbered several hundred thousand and have been a fairly well settled area from A.D. 623 to 658, presumably remaining so under the later rule of neighboring powers. The impression of considerable size is given also by the curious list of Slavic tribes with their cities (*civitates*) which is thought to be of the seventh century. These data will require study before their demographic implications, if any,

[80] Lunt, W. E., *Financial relations of the Papacy with England*, 1–16, Cambridge, Mass., 1939.

[81] See p. 95, note 64.

[82] Including the counties of Cornwall, Devon, Somerset, Dorset, Wiltshire, Hampshire, Berkshire, Essex, Kent, Sussex, Surrey, for a total of 432,958. See Russell, *BMP*, 53.

[83] Bede, *Hist. Eccl.* II, 9.

[84] The cantref should include a hundred hamlets but actually the cantrefs of Anglesey in the thirteenth century had forty hamlets on the average. Professor U. T. Holmes has suggested that the term "cantref" might be a shortening of *dugaintref* (forty hamlets) under the influence of the Frankish and German use of hundred. Professor Thomas Jones suggests that the tref was a cluster of huts and thus part of a hamlet.

[85] Professor Pierce Jones says that this was true of even the early medieval period.

[86] For a general statement see *Camb. Med. Hist.* **2**: ch. xiv.

[87] Runciman, S., *A history of the first Bulgarian Empire*, 22–23, London, 1930; Lemelle, P., Invasions et migrations dans les Balkans, depuis la fin de l'épogee romaine jusqu'au VIIIe siècle, *R. H.* **211**: 265–308, 1954; for map of ninth century Slavic tribes see Vernadsky, G., *Ancient Russia*, 327, New Haven, Yale Univ. Press, 1943.

[88] Vernadsky, G., The beginning of the Czech state, *Byzantion* **17**: 315–328, 1944–1945. See also: Troya, C., *Codice diplomatico Langobardo dal 568 al 774* **1**: 599–602, Naples, 1852–1854.

TABLE 99

EARLY MEDIEVAL SLAVIC TRIBES AND CITIES IN THE BALKANS

Groups	Tribes	*Civitates*
Tribes just across the Danube	13	264
Their Neighbors	26	4,121
The Ruzzi, etc.	8	187

Source: Troya, C., *Codice diplomatico Langobardo dal 568 al 774* 1: 599–602, Naples, 1852.

can be ascertained (table 99). The divergence in size of unit is so great that one suspects difference of unit. If we could assume the 4,121 of the neighbors were villages, and they can hardly be otherwise unless their number is hopelessly overestimated, one might make an estimate. The Slavic villages would hardly average more than 100 to a village, thus setting a maximum of about 400,000 for the neighboring tribes. If the others with about the same number of tribes had an equal population, a Slavic group in the Balkans of about a million would be indicated.

An Arab traveler stated that the Northmen in Russia near the end of the period numbered about 100,000 persons.[89] They were largely concentrated in such cities as Novgorod, Kiev, and Smolensk, and constituted a real ruling class. The total of the Slavic people whom they ruled must have run into the millions.

The changes in this period are harder to follow because the evidence is not so definite as for the preceding period. The assumption was made that there was a uniform decline of about 40 per cent produced by the plague from 543 to the end of the century. It is likely that this was not true of the drier lands, particularly of Arabia (outside of the area usually considered) and that this unusual balance of manpower was a factor in the Mohammedan advance. There has been an assumption of a rise everywhere except in North Africa where nomadism seems to have spread. The places of most rapid rise were probably in Spain and in the Slavic lands.

IX. MEDIEVAL INCREASE, 950–1348

The height of the Middle Ages as the period from about 950 to 1348 is often called, probably took its impetus from the remarkable increase in population of that period.[1] This increase is apparent in additions to the areas of the cities and in the extension of arable territory. The condition of the population of the east is not so clear, but the direction of the Crusades would indicate that it was not increasing as fast as the west, if it was increasing at all. The advance ended abruptly with the second appearance of the plague which apparently followed much the same pattern that had been typical of its first appearance centuries earlier. There is, indeed, some evidence that even in the west of Europe population increase was slowing down and that demographically it was reaching a ceiling with respect to subsistence. It was thus ready for decimation by plague. Earlier the vigor exhibited by the peoples of the west is characteristic of populations expanding rapidly within the limits of subsistence.

1. BYZANTINE EMPIRE AND NORTHEAST EUROPE

In this period the Byzantine Empire still retained a certain influence over the Balkans and the territory to its northeast. The empire had for a time at least two taxes which might yield information about population: the ancient *capitatio* and a hearth tax initiated by Nicephorus I (802–811) and abolished by John (972–973),[2] but neither seems to have left any records. Even the information about the size of cities is not very satisfactory.

The population of Asia Minor and the Balkans probably remained at the high level of 8 and 5 million during the prosperity of the early part of the period. One item gives a hint in regard to the population of Constantinople. In 1037 an official bought 100,000 *modii* of grain in Greece and the Pelopennesus to relieve a famine in the city, created by a six-months' dearth of rain. A procession to pray for rain was followed unfortunately by a hail storm.[3] If the grain was expected to provide for only a month, about 50,000 people could be fed, but probably only a part of the people required help anyway. This suggests that the city was only 200,000 if one-fourth had to be fed for a month.

A recent study has presented some more information about the situation in the period. Villehardouin stated that one fire which, with two others, destroyed about half of Constantinople in 1204, wiped out an equivalent of France's three largest cities. The latter probably did not number more than 50,000. This suggests a city of at least 100,000 in size; it would be easy for the crusader to exaggerate. It indicates a population of 6 million for Asia Minor (assuming 3 million in Seljuk territory) and perhaps 4 in the Balkans, assuming Constantinople as the metropolitan city to have 1½ per cent of the total. The population was apparently declining throughout the period.[4] Thessalonica which probably had about 40,000 in 1423 probably had more

[89] *Camb. Med. Hist.* **2**: 429.

[1] Lopez, R. S., Still another Renaissance? *Amer. Hist. Rev.* **57**: 3–21, 1951–1952.

[2] Diehl, C., *L'Empire orientale de 1081 à 1453*, 33, Paris, Presses universitaires de France, 1945; Schlumberger, C., *L'épopée byzantine* **1**: 183, Paris, 1896.

[3] Cedrenus, in *Pat. Gr.* **122**: col. 248–249. For the situation: Janin, R., Un ministre byzantin, Jean de Orphanotrophe, *Échos d'Orient* **30**: 438, 1931.

[4] Charanis, P., A note on the population and cities of the Byzantine Empire in the thirteenth century, *The Joshua Starr memorial volume*, 135–148, New York, Jewish Soc. Sci. Publ., **1**, 1953. On Constantinople, pp. 137–138, and on the decline, p. 137.

earlier. The next city, Tralles, may have had about 36,000, while Nicaea probably did not have many less [5] and Athens was quite small.

A tentative estimate of the population of Asia Minor may be made from the area of probably the two largest cities of central Asia Minor under the Seljuks, Ankara and Konia. In the eighth century Ankara apparently had an area of about 250 hectares. Under the Seljuks (eleventh–twelfth centuries) this increased to 275 and under Osman (about A.D. 1300) about 300 hectares.[6] Konia was the capital of the Seljuk sultanate. Its walls, built about 1221,[7] included about 176 hectares [8] but these were within a garden area of perhaps 2,000 hectares.[9] Ankara thus probably had a population of about 40–45,000 and Konia about 25–30,000. The area subject to the Seljuks at 1½ per cent for the largest city should have had about 3 million inhabitants. The Turks for long did not control the coast cities or even considerable parts of the western third of the peninsula.[10] The total population of the peninsula may be estimated at 6 million at about 1200 and, since Ankara was expanding, at perhaps 7 million about 1300.

The size of the Hungarian population in the thirteenth century can be estimated somewhat from the extent of the cities fortified then. The terror of the Tartar invasions caused the king to put through an extensive building program.[11] The medieval part of Pest would seem to consist of about 36 hectares and that of Buda about 200.[12] At 150 to the hectare the city should have contained about 35,400 persons, the proper size for a metropolis of about 2.4 million. Hungary was quite prosperous during the century before the plague and may have doubled to reach 5 million before 1348. This would have been about the right number to have declined to 3 million at the end of the century.[13] The Hungarians entered the land as a tribe about A.D. 895 under Arpad, presumably a few hundred thousand, like most tribes, and could well have increased to 2.4 million in the middle of the thirteenth century by amalgamating with even a relatively small indigenous group.[14]

During the first century of this period Russia enjoyed a kind of early Golden Age which might be assumed to be based in part upon a relatively large population. Yet the only real clue shows a quite small population. Novgorod in 1016 is alleged to have had an army of only 3,000 which with 1,000 Northmen (Varangians) conquered the main Russian army near Kiev.[15] This suggests a population of not more than 2 or 3 million. The breakup of the central government beginning in 1054, the decline of temperature and the invasion and rule of the Mongolians might be expected to restrain or hinder advance of population within the period. The information is not clear. In spite of these, it may have been increasing. The population, of Russia in the middle of the twelfth century has been estimated by two authorities at about 7½ million. The extent of territory, assuming population so sparse as to be negligible north of Lake Ladoga, was about 1,700,000 sq. km.[16] There were said to be 300 cities within the area,[17] while the population of Kiev, Novgorod, and Smolensk combined was "probably no less than 400,000." [18] The total is easier to believe than the estimates for the three cities.

Smolensk was apparently the largest Russian city in the period with an area of perhaps 400 hectares which should indicate a population of about 40,000.[19] Kiev's plan shows an area of about 120 hectares for the medieval part,[20] while Novgorod had about 200 hectares.[21] In 1211 Novgorod had a fire alleged to have burned 15 churches and 4,300 houses.[22] This should at 4 to the house have burned out 17,200 persons. Judging from the number of churches burned, the fire consumed about half of the city. The great days of Novgorod were at the end of the century and during the first half of the following century when probably the 47 churches [23] now existing had their origin and partial

[5] *Ibid.* for Thessalonica 141, 166; for Tralles 136, 145; for Nicaea 144. For Athens (15–30 hectares): Setton, K., The archaeology of medieval Athens, *Essays in mediaeval life and thought—to A. P. Evans,* 228, New York, Columbia Univ. Press, 1955.

[6] Sizes estimated from map in *Die Welt des Islams* **21**: 85, 1939.

[7] Sarre, F., *Reise in Kleinasien,* 45, Berlin, 1896.

[8] Texier, C., *Asie Mineur,* 662, Paris, 1862. According to Texier there were 108 towers, 40 *pas* apart with ten metres "de front." If the "pas" was a metre, the circumference should have been about 5,400 metres and should have enclosed about 176 hectares. This is larger than an earlier estimate that the circumference was between two and three miles. Leake, W. M., *Journal of a tour in Asia Minor,* 48, London, 1824; Niebuhr, S., *Reiseschreibung nach Arabiens* **3**: 104; the crusaders of Frederick Barbarossa thought that Konia was as large as Cologne. Oman, C., *History of the art of war in the Middle Ages* **1**: 250, Boston, 1923.

[9] Sarre, F., *Reise in Phrygien, Lykaonien, Isaurien und Pisidien, 1895,* ed. Kiepert, map.

[10] See map in *Encyclopaedia Britannica* under "Europe," 14th ed.

[11] Hóman, B., *Geschichte des ungarischen Mittelalters* **2**: 158–159, Berlin, 1940–1943.

[12] Estimated from maps in *EUI* and in Dickinson, 207.

[13] See p. 129.

[14] J. Bossy suggests that the population started at half a million and doubled each century: La population de la Hongrie depuis l'établissement des Hongrois dans le pays, *Magyar Statisztikai Szemle* **16**: 343–348, 1938. That would give 8 million by 1295!

[15] Michell, R., and N. Forbes, *The chronicle of Novgorod* 1, London, 1914.

[16] Vernadsky, C., *Kievan Russia,* 102–105, New Haven, Yale Univ. Press, 1948. See especially 104, n. 12 and map at end for the area.

[17] *Kievan Russia,* 104.

[18] *Kievan Russia,* 105.

[19] *The earth and its inhabitants* **5**: 286 for map from which the estimate of the medieval section was made.

[20] Spruner-Menke, *Hand-Atlas für Geschichte des Mittelalters,* 3rd ed., 1880.

[21] From map in *EUI.*

[22] *Kievan Russia,* 316.

[23] "Novgorod" in *La Grande Encyclopédie* and *Encyclopaedia Britannica.* This assumes a rapid expansion of the city in the

growth. It is unlikely that in the twelfth century the three cities had a combined population of over 80,000.

A map of Russia under the Golden Horde shows that about one-half of the cities were in the area about Smolensk.[24] If we can assume that as a metropolitan center it was about 1½ per cent of the total of the area, the area should have included about 2.7 million. The population of the rest may well have been somewhat more than twice the size bringing the total to 6 million. Novgorod, probably the province, is alleged to have had 400,000 inhabitants in the fourteenth century and to have lost 134,000 in the pestilences.[25] The area would seem to have been about 234,000 sq. km. If all Russia had had the same population density, it would have had a population of over 3 million. However, the Novgorod area was probably much less settled than the territory to the south so that 6 million would be a reasonable estimate.

If Russian population moved as did that of the rest of Europe it would have increased toward 1348; this it seems to have done. The Mongolians subjected Russia to three censuses, 1245, 1257–1258 and in the 1270's and, on its returns, divided the country into 43 districts of 10,000 each. These were to provide a basis for taxation and for a demand for men. The ratio of demand seems to have been one-eighth of the total population among Mongolian areas and one-sixteenth from China which, like Russia, was a subject state.[26] If we assume that a similar demand was made upon Russia, the 10,000 men demanded should represent 160,000 persons for each district, or 6,880,000 for all Russia under the Mongols. However, since the Crimea and the Volga Valley (sparsely settled) must be added, the total was probably 8 million by 1348. The Golden Horde itself is alleged to have numbered 300,000 which seems rather high for a nomadic tribe.[27] However, its capital and possibly its home at certain times of the year was Sarai (now Carëv) on the Volga, it has been excavated and found to cover about 5,000 hectares.[28] This immense size can be explained by its use as a caravanserai as well as a capital.

2. MOHAMMEDAN LANDS AND IBERIA

The Caliphate of Bagdad experienced its greatest days before A.D. 950 although it lingered on, a factor of some importance in the political life of western Asia until the middle of the thirteenth century.[29] Little demographic information about its people has survived. There is some information about Syria, Egypt and North Africa although it is not extensive and is very uneven in quality. The data from Spain are considerably greater, particularly at the end of the period when the Christian states of the Reconquest presented a considerable documentation.

TABLE 100

SIZE OF SYRIAN CITIES AT THE TIME OF THE CRUSADES

City	Size in hectares	Population estimate
Antioch	325	40,600
Edessa	192	24,000
Damascus	120	15,000
Aleppo	112	14,000
Jerusalem	80	10,000
Tripoli	80	8,000
Hims	56	7,000
Hama	54	6,750
Gaza	49	6,125
Hebron	45	5,625

The apparent decline of population in Asia Minor was probably paralleled in Syria where the border struggle between the caliphate and the Byzantine Empire was particularly devastating. For the time of the Crusades an estimate of population can be made, based upon the size of cities.[30] This fits the pattern expected of cities within an area remarkably well and points to a population of about 2.7 million. The size of cities and estimate of population are in table 100. After the expulsion of the Crusaders the population probably rose until the time of the Black Death.

The area of Fatimid Cairo was apparently about 176 hectares.[31] This assumes a population of only about 25,000 as a total in a country of less than 2 million. However, to Cairo itself must be added Fustat and Old Cairo in the immediate neighborhood, while it must have required some time before Alexandria lost all of the characteristics of a metropolitan city. Damietta, perhaps the third city in size, had about 67 hectares. The total population may well have been in the neighborhood of 2 million, more, probably, than less.

In the preceding period the decline of population in North Africa just before the Arabs arrived was marked.

thirteenth century and that the city of 1211 had about thirty churches.

[24] Spuler, B., *Die Goldene Horde,* 557, Leipzig, O. Harrassowitz, 1943. Smolensk area 31, Dnieper 13, Crimea 10, Volga 4, Mordwinen 4.

[25] *La Grande Encyclopédie* under "Novgorod" attributes the loss to the pestilences of 1467, 1508, and 1533.

[26] Vernadsky, G., *The Mongols and Russia,* 126–127, 215–217, New Haven, Yale Univ. Press, 1953: also in *Speculum* **26**: 262, 1951.

[27] Spuler, *Die Goldene Horde,* 285 quoting Barbaro, 16. This estimate was made at the time of the fall of the Horde in the fifteenth century.

[28] Spuler, *op. cit.,* 266 quoting Balodis 21, 23, 28. The city is said to have had thirteen mosques and a Christian bishop.

[29] On the decline in the size of Bagdad compare maps: Le Strange, G., *Baghdad during the Abbasid Caliphate,* opp. 47, 231 and 263, Oxford, 1924. In the period 400–700 A.H. the inhabited area was about 2,300 hectares.

[30] This information will be given in full in a chapter, Demography of the Crusades, in a later volume of *History of the Crusades* under the editorship of K. Setton.

[31] For Cairo: Baedeker, K., *Egypt and the Sudan,* London, 8th ed., 1929; under "Cairo" in the *Encyclopaedia of Islam.* For Damietta: King, E. J., *The knights hospitallers in the Holy Land,* 191, London, 1931.

Now the political condition of the area was not such as to anticipate an increased population there. From 680 on the temperature was at its height and rainfall was very low. The desiccation which naturally resulted would tend even more to restrict the sedentary area and reduce the economy to a pastoral, semi-nomadic area. Furthermore, the Berbers had exhibited little organizing genius and thus could not help the Arabs much to create a strong central government as the Greeks and the Persians were doing. North Africa was also a long way from the centres of Arab rule, Mecca, Medina, Damascus, and Bagdad. The situation was ideal to create in the area another Arabia which would, of course, assume a relatively small population.

There is even a clue as to the population. An Arab is quoted as saying that about 50,000 horsemen were involved in the Arab invasions of about the middle of the eleventh century and that the total population was about a million.[32] The evidence of the next period would tend to show that here as elsewhere population rose with some rapidity. Declining temperature and increasing rainfall would account for the rise even if the political situation did not improve.

A somewhat larger estimate can be derived from other evidence. Data apparently secured from the official books of the inspector of the city of Fez in the time of al-Nasser (1198–1213) say that the city had:[33]

89,236 houses	3,064 *fabriques*
19,401 chambers	117 public wash houses
467 inns	86 tanneries
982 *boutiques*	116 *teintures*
2 bazaars	136 *fours pour le pain*
	1,170 *autres fours divers*

In the time of al-Mansur (1184–1199) it was said to have had:[34]

785 mosques	122 fountains
42 diar loudhon (latrines)	83 public baths
80 skayat	472 *moulins*

The population of such a group would have been about:

89,236 houses at 4 to a house	356,944
19,401 chambers at 1 to a chamber	19,401
467 inns at 6 to an inn	2,802
	379,147

Needless to say, unless these figures are deliberately forged they refer to a whole province. This is what we should expect since Moslem provinces usually carried the name of the capital city (*medina*). It is very unlikely that a city of nearly 400,000 Moslems would have only 83 public baths or 42 latrines. The number of other items points to a city and lesser places and villages.

The city of Fez was a double city whose medieval boundaries were probably not much different from those of the last century. The larger of the settlements apparently enclosed about 200 hectares while the lesser had about 120. Since the city does not seem to have been crowded, it may have numbered 30,000 persons. At the height of its power Fez's ruling dynasty dominated North Africa well toward Tunis and even parts of Iberia. Such a city may well have been the center of a population of 2 million. This estimate of the city discounts two other statements. One is that the greater of the two Friday mosques could hold 22,700 persons which, for the larger settlement, should indicate a population three times as large, or about 68,000.[35] The second is the statement that at one time 8,000 families moved there from Córdoba and at another time 3,000 families from Kairwan.[36] Both were probably exaggerations on a generous scale.

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Iberian population between the time of Almansor (died 1002) and the plague must be estimated from somewhat less than satisfactory evidence. The population at the beginning of this period has been estimated at about 7 million. About 1280–1290, as will be seen, it was near 8.3 million and then presumably rose close to 9.5 million before the plague struck. The chief question is whether population rose steadily from the 7 million to the 8.3 million between 1000 and 1280 or whether it declined first and then recovered. The heavy fighting of the taifa period (that is, of the small Mohammedan states) and of the Reconquest alternating with the Almoravide and Almohade domination might make one favor the idea of a decline in the twelfth century. On the other hand most of the other European states commenced their increase about A.D. 1000 which, assuming parallel development in Spain, would suggest a continuous increase. In the period Iberia shifted from the Mohammedan economy to that of the European-Mediterranean world.

Naturally Córdoba declined; Edrisi (mid-twelfth century) remarked that the great suburb of Az-Zahra was in ruins and upon the point of disappearing,[37] and the city itself had declined. A second and rather casual item is the statement of a North African chronicler that when Niebla, a southern Spanish city, was captured in

[32] Marçais, G., *Les Arabes en Bérberie du XIe au XIVe siècle*, 112–113, Paris, 1913. He says that Leo Africanus quotes it from Ihn-er-Raqiq. He is inclined to accept the figure. Leo Africanus also suggests an Arab population in North Africa at 80,000 before the eleventh-century invasions. It is not certain whether he means a total or just the men. Even if he means the latter, an Arab population of about 300,000 was not large. Leon l'Africain, trans. 1930, 1: 22.

[33] Ibn Halein said that he got it from a book of Abu el Hassen Aly ben Omar el-Youssy who took them from the official book of El Kouykiry. *Roudh el-Kartas*, trans. A. Beaumier, 57, Paris, 1860.

[34] *Ibid.*, 57.

[35] *Ibid.*, 56.

[36] *Ibid.*, 83–84.

[37] Dozy, R., y M. J. de Goeze, *Description de l'Afrique et de l'Espagne par Edrisi*, 262–263, Leiden, 1866.

1154 its defenders were slaughtered.[38] These included 8,000 men from the city itself and 4,000 from the countryside. The total represented by these men should be about 36,000. However, it is doubtful whether all of the men of the countryside went to defend the city. The population of Niebla at the time of al-Hakim was about 12,480 houses or near 50,000 persons.[39] If any considerable portion of the countryside did not assist in the siege, the population of 1154 cannot have been much different from what it had been centuries earlier. This assumes, of course, the accuracy of the chronicler's information. Even as late as 1293 [40] Niebla was paying much more heavily than cities which three centuries later were far larger, but even its contribution was not large.

The very common payments on houses were known early in Iberia. Sahagun paid in 1150 a shilling a house,[41] a typical payment. In 1195 Aspuoz in Navarre agreed to pay 12 dineros a year to a house.[42] In 1418 the village of Anza had its censo reduced to 10 sueldos for each house like the other places in the valley.[43] In 1192 Erasun paid a *pecha* of 4 sueldos a year for each house, but widows with no men in their houses could pay one-fourth.[44] In 1301 at Viana each person (presumably men) were to pay 10 dineros.[45] The revisions at the end of the twelfth century substituting so much a family or a house in place of fixed sums would seem to indicate population decline, making it difficult to pay the original lump sum.[46] The custom was widespread to pay 10, 11, or 12 of the lowest unit of payment. These payments, if they followed the ordinary history of taxation, would either remain fluid at the general rate of taxation or become fixed at a set sum. It is in the light of these conditions that two interesting documents of the thirteenth century may be examined.

The first comes from the area of Calatayud in Catalonia from the years 1281 to 1285. The manuscript containing the data is in bad shape since the paper has been waterlogged along the edges and it is often difficult to read. It gives accounts for three years which seem to offer a scale of payments which may be compared with population figures of 1553 (table 101). If we can assume, what is not certain, that the *solidi* were frozen in accord with *vecinos* in the thirteenth century, then it indicates that the population of about 1553 was about 11 per cent greater than it had been at the time of freezing in the thirteenth century. This would give Catalonia a population then of about 264,846 and would require a 21 per cent increase to bring it to 326,000 just before the plague, assuming that Catalonia experienced only a 10 per cent decline from the Black Death before 1359 when its population was about 294,000 (table 122).

TABLE 101

COMPARATIVE POPULATION OF TOWNS OF CALATAYUD, 1280–1281 AND 1553

Name of town	Number of *solidos* paid 1281–1285	Number of *vecinos* about 1553	*MS A-2*, folio number
Alcubiere	60	87	105v, 110v
Almudebar	85	112	105v, 112r
Aranda	118	207	108v
Arandiga	30	32	108v
Berbagine	100	107	106v
Calcena	90	115	107r,
Grañon y Pombion	60	37	105v, 110v
Loharse	30	45	106r, 111r
Paracuelled de la Ribera	45	45	108v
Rueda	45	43	108r
Robres	60	24	105v, 110v, 112r
Torrellos	200	170	104r

Sources: for 1281–1285, Madrid, Academy of History, Salazar Colección, *MS A-2* (folios as above) and for 1553, *Censo de población*, 129–130.

Somewhat the same result appears with respect to payments from several places in the accounts of Sancho IV written about 1293 (table 102). These rather detailed data were among the papers of the Cathedral Chapter of Toledo and thus survived the disappearance of the early royal accounts. The data are not well defined but appear with payments by Jews and Moors which in many cases were poll taxes. The amounts are about as proportional as any could be which deal with comparisons of population after three hundred years of change. If, again, we assume that (1) the taxes based upon population became fixed in the thirteenth century and (2) it was about 108 families to 1,000 maravedis [47] the population of 1293 was a fourth higher than in 1553.[48] If we assume further that the

[38] *Roudh el-Kartas* (note 33 above), 277. This work of al Halein is translated under the title, *Histoire de sovercins du Maghreb*.

[39] See p. 91.

[40] Madrid, National Archives, *Cod. 1269*, accounts of Sancho IV, unfoliated near center. Carmona 1000 m (9,219); Marchena 600 m (13,939); Niebla 3000 m (1,192); Gibraltar 500 m; Xeres 2,000 m (21,721); Cales 430. The figures in parentheses are numbers of persons in the census of 1597.

[41] Puyol y Alonso, J., *El abadengo de Sahagun*, 35, Madrid, 1915: other instances are given by E. Mayer, *Historia de las instituciones sociales y politicas de España y Portugal* 1: 286–287, Madrid, 1925; de Hinojosa, E., *Documentos para la historia de los instituciones de Leon y Castilla, X-XIII cent.*, 119, 189, Madrid, 1919.

[42] Yanquas y Miranda, J., *Diccionario de antigüedades del reino de Navarra* 1: 71, Pamplona, 1840.

[43] *Ibid.* 1: 75.

[44] *Ibid.* 1: 383.

[45] *Ibid.* 3: 492.

[46] *Ibid., passim.*

[47] Based upon the theory that widows would reduce the total about this much. For instance, if 10 per cent of the families were headed by widows paying only a fourth, there would be about two hundred families paying 185 maravedis.

[48] *Censo de población*, 198–226. Figures: $32{,}944 \times 1.08 = 35{,}579.5$. $35{,}579 \div 2{,}871 = 1.24$.

TABLE 102

COMPARISON OF DATA IN CUENTOS OF SANCHO IV WITH POPULATION IN 1553

Bishopric of Burgos				Bishopric of Calahorra			
Place	Number of maravedis, 1293	Population 1553	Ratio	Place	Number of maravedis, 1293	Population 1553	Ratio
Medina de Pomar	2,750	250	11–1	Calahorra	4,500	812	5–1
Frias	3,951	250	16–1	Arnedo	4,000	500	8–1
Belhorado	5,000	700	7–1	Navarette	3,500	707	5–1
Lerma	2,400	25	9–1	Albelda	600	128	4.5–1
Aguilar	6,000	500	12–1	Nalda	500	300	1.6–1
Villadiego	6,000	500	12–1	Alcanadre	800	250	3.2–1
Amaya	550	40	14–1	Jubera	2,000	100	20–1
V N Mal	160	15	11–1	Yanquas	3,100	1,072	3–1
Pampliega	2,000	100	20–1	Clavijo	200	130	1.5–1
Calcedo	100	31	3–1	Lunbreras	500	260	2–1
Arcus	833	90	9–1	S. Roman	300	52	6–1
Aroyal	200	20	10–1	Soto	800	220	3.7–1
Miranda	3,000	450	7–1	Arnedillo	600	190	3.5–1
				de la Santz	80	40	2–1
Total	32,944	2,871	11.5–1	Trerons	3,700	230	14–1
				Logroño	6,000	2,145	3–1
				Total	31,180	7,646	4–1

Sources: 1293, Madrid, National Archives, *Cod. 1269* (unfoliated but data near center); 1553, *Censo de población*, 198–226.

Calahorra figures are 3 to a family rather than 12,[49] the result is a fifth higher for 1594 than for 1293.

It would seem that the population of Iberia of about 1280–1293 was roughly about where it was to be in the middle of the sixteenth century or about 8.3 million.[50] This predicates some increase between that date and the Black Death beginning in A.D. 1348. This increase would seem to have been typical of the population of the peninsula in the decades immediately preceding that of the document used above (table 102). An estimate is suggested based upon the probable mortality of the plague. The dry climate of the Iberian peninsula (except for the extreme north and scattered areas elsewhere) certainly held down the death rate from the plague in these dry parts. An estimate of 9.5 million is hazarded although the scarcity of evidence from these dry parts leaves it a conjecture. There are interesting bits of information which may be added but change the picture little.

For this period there is some information about the city of Valencia. Its Moorish walls enclosed about 47 hectares,[51] and should have contained a population of perhaps 7,000–10,000 persons. By the thirteenth century the population had spread beyond these walls. When Valencia was captured by Jaime I in 1238, the king gave most of the houses to soldiers and others. Within a few years he had a survey of the city made house by house.[52] This lists about 2,850 houses and a supplementary list of about 1,020 dwellings described as "superfluous or simple." If we assume that under the Moors all had been occupied with about 3.5 persons to the dwelling, the population would have been about 13,500. The city increased in size so that in the fourteenth century another wall was raised which included 142 hectares and thus surrounded 25,000 to 30,000 persons. By the end of the Middle Ages a parish had

TABLE 103

NUMBER OF HOUSES IN BALEARIC CITIES, 1240 AND 1545

Place	*Ca.* 1240	1545
Mallorca—inhabited	2,898	2,155
Mallorca—not inhabited	494	977
Inqua	426	511
Polentre	263	419
Sixneu	533	342
Petra	518	183
Iartan	247	292
Montneu	727	205
Total	6,106	5,084

Sources: Barcelona, Archivo de la Corona de Aragon, Cancillería, *Reg.* 16 published by de Bofarull y Mascaro Prospero, *Repartimientos de los reinos de Mallorca, Valencia y Cerdeña*, 1–143, Barcelona, 1836; *Censo de población*, 198–226.

[49] Figures: $34{,}380 \times 1.08 = 37{,}130$. $7{,}636 \times 4 = 30{,}544$. $37{,}130 \div 30{,}544 = 1.22$. Possibly for part of a year only.

[50] Assuming that the population of about 1553 was not much different from that of 1492, for which see table 124.

[51] Information about the walls appears on a map in the Ayuntimiento. The Roman wall enclosed only about 7.5 hectares.

[52] Barcelona, Archivo de la Corona de Aragon. Cancillería, Escribanía Real, *Reg. 7*, edited by de Bofarull y Mascaro, Prospero; *Repartimentos de los reinos de Mallorca, Valencia y Cerdeña*, 143–656, Barcelona, 1856.

even been set up outside of the walls. In this period Valencia experienced a kind of a golden age.

King Jaime had previously conquered the Balearic Isles and had made extensive gifts of houses there to his soldiers in the following *terminos*. The houses listed there may be compared with the numbers listed for the same places in 1545 as in table 103. If *terminos* means merely the city proper then the population of the Balearic cities was considerably greater then than three centuries later. However, if the *terminos* include houses in the villages within the jurisdiction of the seven larger cities, the population may well have been larger in the sixteenth century. The former, however, seems more probable. The Balearics seem to have occupied a greater maritime role under the Mohammedans than later.

The Christians of Castile retained the Moslem poll tax on Jews or revived it. A well-known document would seem to indicate the population of the Jews. The tax, like the Moslem precedent, touched only men but it seems to have included all who were married or over twenty.[53] This would have given about one-quarter of the total population.[54] The number of persons represented by a total of the year 1284 (2,564,855 maravedis) is suggested as a third of the number of maravedis, or 854,951.[55] This would give more than 3,200,000 Jews for Castile in the period, even though the total population of the area could hardly have been more than 8 million at most. Another suggestion is that the number is one-tenth of the total number of maravedis which would bring a total Jewish population of about 320,000.[56] This fits in more nearly with post-plague figures: one of 1366 when at least 3½ per cent of the population of Navarre was Jewish.[57] The lower estimate would place the Jewish population of Castile probably between 4 and 5 per cent.

In 1147 northern crusaders captured Lisbon and related some figures, alleged to have come from the alcalde of the city. It had, according to the story, 154,000 men; this included some persons from a nearby captured city but no women and children. It was also alleged, probably from the same source, that the city had 60,000 tax-paying families. It had only 15,000 units of fighting equipment and thus used them in relays.[58] The medieval city occupied about 48 hectares and had modest suburbs: at the large estimate of 200 to the hectare, it would have had a population of less than 10,000. Now, as a provincial capital having less than 4 per cent of the total its provincial inhabitants should have numbered about 250,000. This is about what 60,000 tax-paying families should have numbered. The other figures seem somewhat exaggerated.

[53] Amador de los Rios, J., *Historia social, política y religiosa de los Judios de España* **2**: 58, Madrid, 1875.

[54] See p. 50.

[55] Amador de los Rios, **2**: 58.

[56] Criticized by the same, *ibid.* **2**: 58.

[57] See p. 114. Viana.

[58] David, C. W., ed. *De expugnatione Lyxboniensi*, 95, New York, 1936.

TABLE 104

ENGLISH AND FRENCH POPULATION ESTIMATES, 1086–1346 (MILLIONS)

Time	England	France, 1328	France, 1794	Gaul
1086	1.1	4.0	5.2	7.3
1100	1.3	4.7	6.2	
1150	1.6	5.8	7.6	
1200	1.9	6.9	9.2	
1250	2.5	8.1	11.9	
1300	3.3	12.0	15.7	
1346	3.7	13.5	17.6	24.6

3. NORTHWESTERN EUROPE

Northwestern Europe, as used in this chapter, will include France, Britain, the Low Countries, and Scandinavia. The material for Britain is very extensive and has been recently published. In general it may be said that the population was increasing rapidly in the period, in England from 1.1 million in 1086 to about 3.7 just before the Black Death. For all of the British Isles the total would be about 1.72 million in 1086 and 5.25 just before the Black Death.[59] The French evidence will be given in more detail since much of it does not appear in print and can be given a different interpretation from that given in the standard studies of French population. The information about the Low Countries and Scandinavia is rather scant.

Since the population increase of England is reasonably clear, and it is possible that French population increased at much the same rate, it might be well to set up an hypothesis that the two were comparable and then check other data against the result. This can be done, for instance, by finding when the French cities began to spread beyond their Roman walls and by more direct data from the cities themselves. There is the splendid hearth tax list of 1328 which may be used as the anchor of the comparison.[60] In table 104 three areas are compared with the English rise, the area contained in Roman Gaul and the smaller areas of France of 1328, and France of 1794.

Professor Lot, using various documents of similar character, gives an estimate of the number of hearths both for the territory under the control of the French King in 1328 and of the territory later held in 1794.

[59] Russell, *BMP*, 54, 280 360–362. For Scotland: Cooper, T. M., The numbers and the distribution of population in medieval Scotland, *Scottish Hist. Rev.* **26**: 2–9, 1947. It is doubtful if the Celtic cultural areas increased as rapidly as did other European cultures of the time.

[60] Edited by F. Lot: L'état des paroisses et des feux de 1328, *Bibl. Ec. Chartes* **90**: 51–107, 256–315, 1929. One of the local rolls had been edited: Molinier, A., La sénéchausée de Rouergue en 1341, *ibid.* **44**: 452–488, 1883: from B. N. *MS nouv. acq. lat. 185.*

The document itself notices certain failures in reporting hearths and parishes even then under direct royal control (A). In 1328 considerable territory was held as practically independent fiefs (B) and apanages (C) as well as a few other areas not classified as either (D). The subsequent additions (E) he also defines: these include some territory now held by Belgium. Professor Lot multiplied the number of hearths by 5 to estimate total population, except for Paris for which he used 3.5. He estimated the population held by the French king in 1328 as possessing 16–17 million and the area covered by the kingdom of 1794 as having over 20 million.[61] However, as we have seen earlier, there seems no reason for multiplying by more than 4 with regard to the hearth tax of 1328. This would give a 1328 area population of about 13.4 million and the area as of 1794 about 17.6 million.

TABLE 105

FRENCH POPULATION BASED UPON HEARTH TAX DATA OF 1328

Area	Number of parishes	Number of hearths	Area in sq. km.	Population estimate
Vicomté of Paris	567	116,986		
Baillie d'Auvergne	727	90,621		
B. des Montaignes d'Auvergne	215	27,382		
Senechauciée de Xanctonge	580	72,542		
S. de Rouergue	577	52,823		
B. de Mascon	1,029	111,912		
B. de Caus	605	41,901		
Navarre-Valois	323	18,349		
Cresy	14	1,643		
Victry	411	55,996		
Bourges	884	119,835		
Amiens	1,144	115,716		
B. de Chaumont	813	48,776		
Gisors	684	61,981		
S. de Poitou	949	116,170		
Troyes	374	34,772		
Costantin	642	64,307		
B. d'Anjou	701	80,808		
B. de Maine	586	55,333		
Touraine	606	74,177		
Roan	602	60,637		
Gascoigne et Agenois	945	90,318		
Senlis	723	65,606		
Valays	107	9,392		
Limosin	234	25,421		
Meaux	293	33,836		
Caen	978	51,204		
Bigorre*	394	12,378		
Pierregort* et Caours	1,455	130,672		
Vermandois*	1,359	130,662		
Carcassonne*	1,084	84,271		
Sens	1,014	153,310		
Tholose	1,619	153,590		
Beaucaire et Nîmes	992	102,268		
Total‡	23,800	2,470,000	322,000	9,900,000
A (see text)	830			
B Grand fiefs	5,075		83,623	
C Apanages	2,359		27,098	
D Navarre-Bearn	520			
Total, 1328	32,500	3,363,752	424,093	13,455,000
Estimate for 1328 of France of 1794	39,650	4,398,500		17,600,000

Source: Lot 305–308 for hearth tax data, pp. 271–280 for grand fiefs, pp. 281 for apanages. Numerous manuscript variations are given by Lot.

* Instead of by parishes these are said to be "compté citez, chasteaux villes et lieux pour paroisses."

‡ The totals in the MS are 23,671 and 2,469,987 and the mathematical totals are 24,227 and 2,462,395. The totals in the table are given by Lot as indicating the probable round number represented by the political units at the time. It will be noticed that there is no significant difference.

The additions to the walls of French cities began in the eleventh century at Geneva and Rouen[62] and appeared in the twelfth century at Angoulême, Bourges, Grenoble, Marseilles, and Poitiers. In the thirteenth century additions were made at Bordeaux (2), Cahors, Clermont, Limoges for the first time while second additions appear in Cahors, Geneva, and Marseilles (2). Finally in the first half of the fourteenth century they were made at Agen, Avignon, Cavaillon, Geneva, Grenoble, Limoges, and Rodez. For some of these places the additions were very great, enclosing areas which were not at all inhabited, as at Angoulême, Avignon, Bordeaux, and Poitiers. In some places, as at Orange, the medieval population apparently never exceeded the Roman. The use of walls does not lead to very definite conclusions. It would appear in general that the population reached Roman levels in the twelfth century. Six million would be about right as an estimate on this basis if France's population paralleled that of England in this period. Since the population of Gaul has been estimated as approximately 6 million when the walls were built, the two approaches to the solution of twelfth-century population coincide within reason.

The population of Paris, the metropolis of France, increased rapidly in this period. At its beginning the city occupied the island with the parishes of St. Germain of Auxerre and St. Gervais on the right bank and St. Severin on the left. Small settlements appeared near some of the religious houses in the neighboring countryside. The twelfth century saw possibly seven parishes set up on the island and three on the left bank.[63] At the end of the century Philip Augustus constructed a wall which enclosed about 253 hectares.[64] Since the area was not entirely inhabited at the time it is doubtful that the density was more than 100 to the hectare and thus about 25,000 persons inhabited the

[61] Lot was using Ypres as the basis for 3.5 a family for Paris but gives (288–293, 296–298) no reason for the use of 5.

[62] *DACL* under "Rouen." The wall was possibly of the tenth century.

[63] For the churches and their history: Valentin-Dufour, État du diocèse de Paris en 1789, *Bull. d. Com. d'hist. et d'archéol. d. diocèse de Paris* 1: 197–201, 314–354, 411–433, 1881.

[64] Lavisse, E., *Histoire de France* 4 (1): 22, Paris, 1902. This volume by A. Covile.

TABLE 106

PARISHIONERS OF THE DIOCESE OF CHARTRES, 1260

Deanery or patron	Number of parishes	Number of *parrochiani*	Average to parish
Epernon	34	4,554	134
Auneau	23	2,640	115
Rochefort	67	6,963	104
Brou	36	3,388	94
Perche	38	4,948	130
Courville	13	1,594	123
Dreux	50	6,143	123
Brézolles	90	7,159	80
Pincerais Poisse	158	14,793	94
Dunois	126	13,170	105
Blois (archd.)	84	10,766	128
Vendome	59	6,231	106
Chapter	59	5,157	87
Bishop	20	1,862	93
Church	12	1,096	91
Chancellor	2	150	75
St Martin	2	84	42
Almoner	1	72	72
Total	874	90,770	104

Source: Guérard, B., *Cartulaire de l'abbaye de Saint-Père de Chartres*, cccvii-cccxliv, Paris, 1840. This part edited by Le Prevost.

area. The powers of the French king extended greatly over the French lands in the thirteenth century and should have caused the growth of the city of Paris. By the end of the century it had 35 parishes within its confines, as the taille of 1292 shows.[65]

The complete report of the taille of 1292 presents interesting data. The poorest paid a sou while the wealthier paid more. A surprisingly small number paid the lowest amount apparently indicating that it was not a heavy tax. Indeed the sou was paid by valets, other servants, widows, and obviously poor folk, while very few are said to have paid nothing. Sometimes more than one member of the same family paid. The report is presented street by street and parish by parish, covering 31 parishes within the walls and adjacent territory of about 378 hectares and 4 others (Lorenz, Medard or Maart, Marcel, and Notre-Dame des Champs with 527 contributors). Under the circumstances it would seem that the 15,200 contributors can hardly be multiplied by more than 3.5 to represent about 53,200 persons. To these should be added perhaps 6,000 (to be generous) for clergy and university,[66] to bring the total near 60,000. It seems obviously impossible that the same 35 parishes could have 61,098 hearths only 36 years later in 1328.[67] It would seem that instead of 61 the number should have been 21, assuming a *iii* to have been added under the original *xx* when copying the original.[68] Multiplying 21,089 by 4 would bring a population of about 84,376. If the walled area of 1367 may be presumed to have been inhabited by 1328, as is likely, the area of habitation was about 439 hectares. Probably not many still lived outside the walls and thus the density would be about 192 which might be expected of a busy and growing city. Perhaps it reached 90,000 before 1348.

Another approach to the population of part of thirteenth-century France is through some data about *parrochiani* of the diocese of Chartres, apparently of the year 1260 (table 106). Presumably the parishioners were those who had been confirmed and thus should be about two-thirds of the population.[69] If a family averaged 3.6 persons, then the total number of parishioners should be divided to get the number of families and presumably the number of hearths. Unfortunately Chartres is not included in the 1328 hearth tax list as such but its near neighbor, Maine, had about 90 to the

TABLE 107

INCREASE IN NUMBER OF NORMAN HEARTHS, THIRTEENTH TO FOURTEENTH CENTURIES

Name of deanery	Number of parishes	Number about 1236–1244	Number 14th cent.	Reference in Beaurepaire
Basqueville	38	2,474	2,903	p. 417
Baudemont	39	2,529	2,610	
Bourgtheroulde	38	3,171	3,068	
Brachy	34	2,003	2,430	
Bray	25	1,959	1,192	
Cailly	45	2,593	2,937	p. 418
Canville	46	3,421	4,301	
Chretienité	8	918	734	
Envermeu	38	2,847	3,181	p. 419
Eu	31	2,660	2,580	
Fauville	56	14,301	16,369	
Gamaches	43	1,670	1,923	
Gisors	27	1,970	1,969	p. 420
Longueville	34	2,429	3,331	
Neufchâtel	48	4,096	4,235	p. 421
Pavilly	46	3,604	3,425	
Pont-Audemer	41	3,319	3,932	
Ry	50	3,306	3,731	p. 422
St.-Georges	44	3,272	3,574	
St.-Romain	71	5,315	6,264	
Valmont	68	4,588	5,608	p. 423
Total	870	72,445	80,297	Ratio 1.108

Source de Beaurepaire, C., Recherches sur la population de la généralité et du diocèse de Rouen avant 1789, *Mémoires*, Société des antiquaires de Normandie **28**: 361–433, 1870; also in Delisle, L., *Historiens des Gaules* **23**.

[65] Edited by Géraud, H., *Paris sous Philippe-le-Bel*, 624–625, Paris, 1837.

[66] Géraud (p. 477) distrusting his evidence suggested 274, 941 as the population by relying upon a very high average to the hectare.

[67] This was pointed out by Arnould, IX Hist. Congress, *Actes* **2**: 38.

[68] Figures were often given by multiples of the twenties as $\frac{xx}{iii}$. That practice still remains in the French quatre-vingt.

[69] The only good near medieval evidence about age of confirmation to my knowledge appears in the following: Cipolla, C. M., Profilo di storia demografica della città di Pavia, *Boll. St. Pavese* **5**: 26–27, 1943. The evidence is of A.D. 1656.

parish. If Chartres had a similar population density, its numbers must have doubled from 1260 to 1328, faster even than occurred in England at the same time. It may be that some of the churches were actually chapels—which would reduce the amount of the increase.[70]

The great expansion of Paris and the parishes around Chartres was apparently typical of the country, although the rate varied. One list of hearths of Norman deaneries (table 106) shows only a 10.8 per cent increase from about 1236–1244 to a period in the first half of the fourteenth century. The territory around Rouen shows a considerably greater rate of increase. Some 603 parishes about 1240 had approximately 40,372 hearths but by 1328 the number had increased to 60,637.[71] This was an increase of about 50 per cent.

The claverie of Castellane in Provence provides interesting evidence of the rise in population at the end of the thirteenth century. Between 1278 and 1303–1304 the hearths in the towns enumerated in two documents increased in number about 11 per cent (table 108).

TABLE 108

NUMBER OF HEARTHS IN THE CLAVERIE DE CASTELLANE, 1278 AND 1303–1304

Name of place	1278	1303–1304
Bogarry	40	44
Castellane	240	262
Castellet de Robin	13	12
Castillon-Bas	16	21
Castillon-Haut	10	12
Chasteuil	24	20
Chateau-Vieux	24	20
Demandolz	22	32
Eoulx	23	43
Esclapam	17	28
Esclapam-Bastide	18	25
Moriez	80	83
Mosteries de Alpibus	12	22
Robion	4	7
St. Julien	18	11
Soleilhas	60	64
Soleis	20	18
Taloire	18	22
Taulanne	10	15
Ubraye	100	85
Veraillon	15	19
Villars-Brandis	7	10
Total	791	875
Ratio	100	111

Source: Marseilles, Archives de Bouches-du-Rhone, *B 1070* for 1278 and *B 1800* for 1303–1304. The italicized names have not been identified. Possibly the Castellet de Robin was near the Collet de Rouain.

[70] The churches with less than twenty parishoners are arbitrarily classified as chapels but they are not many. Here is another point where local research would be valuable.

[71] Beaurepaire, 429 ff. (see table 107).

TABLE 109

NUMBERS OF HEARTHS IN CERTAIN PLACES IN PRE-PLAGUE PROVENCE

Claverie de Aix—years	*1324*	*1336*	*1346*		
Aix	1,400	1,604	1,486		
Source—Marseilles, Archives de Bouches-du-Rhone (B 1587 gives 1,280 for 1325)	B 1519	B 1590	B 1593		
Claverie de Forcalquier—years	*1290*	*1311*			
Forcalquier	560	581			
Source—as above	B 1884	B 1885			
Claverie de Grasse—years	*1323*	*1345–1346*			
Aiglun	25 or 38	31			
Sigale	142 or 144	144			
Coursegoules	34	40			
Roquestéron	110	110			
Source—as above	B 1519	B 1907			
Claverie de Moustiers—years	*1300*	*1305*	*1327–1328*	*1340*	*1344*
Albarto		15		5	
Esparron	26	36		29	
Moustiers—Sainte-Marie	504	500		621	619
Quinson		75		122	
Riez	400?			680	
Valensole	462	475	660	660	
Ville Dieu	32	36		35	
Source—as above	B 1979	B 1980	B 1983	B 1984	B 1483

This increase is paralleled between 1295 and 1321 by certain places in Bas-Languedoc.[72]

The population of the places in Provence (table 109) was not increasing rapidly just before the plague as it had in the preceding century. The little places seem static although some increase was evident in the larger places. Now, it is possible that the increase in numbers was the result of tightening up of the processes of taxation.

The estimate for about 1200 for France stands at about 9.2 million to which about a million are added to give a total for France and the Low Countries of 10 million. For 1340 the estimate for the group is about 19 million.

The Scandinavian evidence is somewhat scant and contradictory for the period (table 110). Based upon modern arable land (probably greater in extent than medieval arable) the density to the sq. km. in Norway and Sweden was about five. Assuming the same for the modern arable portions (used as a basis for comparison) Denmark would have had a population of

[72] Thomas, L.-J., La population du Bas-Languedoc à la fin du XIIIe siècle et au commencement du XIVe, *Annales du Midi*, 479–481, 1908.

TABLE 110

SCANDINAVIAN POPULATION ESTIMATES ABOUT 1300–1346

Place	Estimate, 1318	Pre-plague estimates	Total area (sq. km.)	Modern arable (sq. km.)
Denmark		(192,500)	38,500	38,500
Finland		(58,500)	390,000	11,700
Norway		123,000	325,000	29,000
Sweden	162,240	212,160	455,000	45,500
Total		606,160		

Source: see tables 57 and 58.

about 192,500 and Finland about 58,500. Now the Swedish evidence suggests an increase in population of a marked character in the first half of the fourteenth century. Yet from the middle of the thirteenth century there seems a decline in the amount of Danish arable land, the result of a climatic change which produced colder and damper weather.[73] Indeed, the weather is supposed to have been warmer over the preceding several hundred years in the north. It might be well to consider the population of Scandinavia at about a half-million from about A.D. 300 to 1300, assuming that constant emigration tended to keep a static population. The increase from 1300 to 1346 in Sweden might have been the result of greater forest and fishing activity.

4. CENTRAL EUROPE: ITALY, GERMANY, POLAND

During this period central Europe was largely controlled or dominated by the revived "Roman" Empire of the German nation. It included most of the German area, exercised an hegemony over much of Italy, and was a powerful influence upon the near Slavic lands. Thus it seems convenient to group these lands together as a convenient and perhaps significant demographic unit. The energy exhibited in the period by the German rulers and by the Italian city states would suggest that it was a period of population expansion as well.

ITALY

Italy shared in the great expansion which occurred in western Europe from about 950 to 1348, more markedly in the northern half than in the middle and the south. One obvious result was the era of communal development experienced by the cities of the north, of which there is evidence of several types. One indication of the increase in population is the addition of new walled areas to many cities. The hearth taxes commence in the thirteenth century in the south and somewhat similar evidence is available in the north so that estimates of size can be made directly.

The Italian population of Roman times had been quite large but the subsequent decline had reduced the size of the cities. It was thus some time before the increase of this period filled up the cities again and created suburbs outside of the Roman walls. It can be seen (table 111) that new walls were built most frequently in the half-century, 1150–1250, particularly in the north. Of course there were many places, especially in the south, which did not need walls. The 1380 hectares comprehended in the Roman wall of Aurelian cared for the city of Rome well into modern times.

The age of wall building reached its peak about 1150–1250. It is reasonable to assume that at about 1200 the population of medieval Italy passed the population of Roman Italy which was estimated in the neighborhood of 7 million. The data for pre-plague Italian population (table 112) unfortunately came from a variety of dates but in general represents the population of the second half of the thirteenth century. Thus it offers a higher estimate of population at about 8.4 million.[74] The explanation of the source of the table is given followed by an examination of evidence about the trend of population in the half-century before the plague.

The figures for the Kingdom of Naples, including Sicily, are known and are given in table 112. It is assumed that the population trend in the islands of

TABLE 111

DATES OF NEW WALLS, MEDIEVAL ITALY

City	Century					Source: Beloch, *BI* 2
	10	11	12	13	14	
Bologna				1203		90
Brescia			(2)			
Florence			1172		(1)	126
Lucca				1200		165–166
Mantua				1242		287
Parma				1250		238
Pavia	(2)		(3)			
Piacenza			1139			249
Pisa		1000	1156			161
Pistoia			(2)			
Siena					(1)	151

The number within parentheses is the number of walls or large additions to walls built in the city in that century. The walls of Brescia and Pistoia were all built in the second half of the twelfth century.

Sources: the dates for the walls of Brescia, Pavia and Pistoia are given by F. Carli, Il movimento demografico in Italia dall' XI al XIII secolo, *Raccolta di studi in onore de R. dalla Volta* 1: 95, Florence, 1936. Data about the walls of Pavia have been kindly supplied by Professor C. Cipolla.

[73] Steensberg, A., Archaeological dating of the climatic change in north Europe about A.D. 1300, *Nature* **168**: 672–673, 1951.

[74] This fits nicely with an estimate of the city and countryside of Pistoia which had about 29,500 persons in an area of 1,100 sq. km. (Carli, *op. cit.*, 88). It had 7,366 families and the area is estimated from a map in the *Enciclopedia Italiana* of Italy of about A.D. 1300. The density of population would be about 27 to the sq. km.: a similar density for all of Italy would give about 8 million.

TABLE 112

PRE-PLAGUE POPULATION OF ITALY
(LATE Thirteenth Century)

Place	Population
Corsica, Sardinia	173,746
Sicily, 1240–1250	600,000
Naples, 1275	2,000,000
Papal States	1,447,846
Tuscany	730,160
Po Duchies	641,540
Genoa	300,000
Milan, etc.	1,000,000
Venice, etc.	1,500,000
Total	8,393,292

Source: Beloch, *BI* **1**: 152, 203, 270, 199–200.

Sardinia and Corsica followed the pattern of Sicily from the thirteenth through the sixteenth centuries and that the pre-plague population was about 70 per cent of the 1550 number, or about 173,746. The inclusive data about the Papal States come from the 17th century. There are data to help trace the trends during the period (table 113). The great increase in the population of Rome is the result, in large part, of the strengthening of the Papacy toward the end of the period. On the other hand Orvieto had declined in numbers and Bologna was holding even. The duchy of Urbino had places which had doubled in size in the period. Probably the southern part of the states followed much the same pattern as the Kingdom of Naples (90 per cent of the seventeenth-century population) and the northern part, that of Tuscany (80 per cent of the 1550 population). A fair estimate is that the pre-plague population was about 85 per cent of the 1656 total, that is 9.3 million.

The data for Tuscany are more numerous than for the Papal States. Florence was larger while its rival, Pisa, had lost out. On the whole it would seem that Tuscany of the pre-plague period had about 80 per cent of the population of about 1550. This would place the total for the area at about 730,160 persons. The Po duchies have very little evidence upon which the trend can be based. Modena had more (20,000) for the pre-plague time than for 1550 (about 15,000)[75] and thus shows a 1.33 ratio. If these are fair samples it would seem that the pre-plague population of the duchies would have been about 40 per cent greater than in 1550. This is reasonable since these places were caught between the great and growing cities and could easily have lost as did Pisa and other places in Tuscany.

For much of northern Italy there are few data before the plague. Milan's population was estimated at 13,000 *portae familiares* in the thirteenth century by Bonvesin of Riva and at 13,600 in the fourteenth century by Galvano Fiamma which, multiplied by 4 each, would give about 52–54,000.[76] In 1542 Milan had about

[75] Beloch, *BI* **2**: 261.

[76] Besta, B., La popolazione di Milano nel periodo della dominazione Spagnuola, Proceedings, Rome **1**: 593 quoting

TABLE 113

COMPARATIVE POPULATION OF PAPAL STATES, PRE-PLAGUE AND 1151–1656

Area	Population (persons unless noted)	Date (Year or century)	Ratio	Date	Population (persons unless noted)	Beloch, BI 2 and page
Rome	35,000	1198–1216	.3	1652	118,047	1, 5, 8
Orvieto	11,264 (2,816 landholders)	1292	2.2	1656	6,000	45, 48
Urbino, duchy	21,650	Early 14th	.53	1656	40,821	79, 81
Pesaro	10,000 (2,500 homines)				20,420	
Fossombrone	6,000 (1,500 homines)				12,551	
Gagli	5,650 (1,170 homines)				7,850	
Romagna Imola	6,000 (1,500 homines)	1288	.51	1656	11,672	84, 87
Bologna	64,000	1206	1.09	1645	58,565	91, 94, 99
Florence	55,000	1347	.92	1551	59,557	133, 140, 129–132
Siena	20,000	1300	.83	1583	24,000	150–155
Pisa	15,000	1228	1.5	1551	9,940	161–163
Poggibonsi	5,000	1226	1.2	1558	2,614	164
	3,000–3,500	1317				
Lucca	14,300	1333	.6	1583	24,000	166
Massa	2,400	1331	.48	1553–1629	5,000	179
Pistoia				1551	6,008	181
Pistoia, contado	7,307 fuochi	1284	.98	1558	7,443	181
				1551	37,018	
Peccioli	2,000	1286	.65	1558–1562	3,086	184
Maremma	2,304	1286	1.33	1558–1562	1,726	184
Senese	3,189	1221	.66	1595	4,820	185
Pistoia	45,405 (9,081 fuochi)		1.04	1562	43,845	186
Val d'Era	5,493 (1,831 homines)		.63	1562	8,333	186

68,500 of which the pre-plague figures were about 75 per cent. However, that city controlled a much larger territory in the sixteenth century. The chances are that Venice and Genoa had about the same population in the thirteenth century that they had in the sixteenth. They both had enjoyed much prosperity in the earlier period commercially and controlled more territory in the later which must have compensated in part for losses in the eastern end of the Mediterranean.

The data do not show a very clear picture of what happened after 1250. Some cities declined: Macerata, Poggibonsi, Palermo, and possibly Pisa. Imola dropped and then recovered in the fourteenth century. In Tuscany, Florence, Lucca, and Siena increased: in the north, Padua and probably many others.[77] The largest city was probably Bologna, at least about 1250, which must have had about 70,000–80,000 persons.[78] Perhaps Venice was larger. The evidence then would favor a gradual increase throughout Italy. Since the population after the plague is estimated at about 5.5 million, its pre-plague number (assuming a 40 per cent decline) should have been about 9.2 million.

For Germany the estimate of 20 million over a long period of centuries is a simple approach,[79] rather too simple to match the vicissitudes of other countries of the time. It is constructed upon evidence showing the continuity of village population from the fifteenth century in many places with items of similar tendency from even earlier periods. Now as early as 1200 apparently three villages of the populous Göttingen area showed 25 to the sq. km. but even here a decline seems to have begun about the middle of the thirteenth century.[80] If this were the average for all of the country, Germany, with its 700,000 sq. km., should have had 17.7 million.

TABLE 114

NEW WALLS OF GERMAN AND LOW COUNTRY CITIES

Century			
10th	11th	12th	13th
Cologne	Bruges	Utrecht, 1122	Bonn, 1243
Verdun	Antwerp	Metz, 1150	Middelburg, 1250
Liege	Tournai	Strasbourg	Nimegue, by 1230
	Ghent	Aachen	Maastricht, *ca.* 1230
	Douai	Brussels, 1122	
	Ypres	Louvain, 1149	
		Antwerp, 1183–1201	
		Malines, 1183–1201	
		Dijon, 1130	

Source: Ganshof, 28–42.

Since there are no German surveys of population which include the whole area, the problem must be approached by less direct and thus less satisfactory means. One method is by sampling, but unfortunately the samples are few. The other is to estimate the total population from the size of the cities which can be regarded as metropolitan cities. This is not easy in an empire which seems to have not set up political centers.

In the Ottonian period (936–1101) Regensburg was said to be the largest city.[81] Its tenth-century walls enclosed about 64 hectares. In the eleventh century new walls enclosed about 95 hectares which were soon overrun. It may well have had a population of 25,000 at the end of the century. In the Rhineland and the north territory Cologne had about the same area but was probably less densely settled and the population may be estimated at about 20,000 inhabitants.[82] The southwestern portion had as its largest city, Strasbourg, which shortly after 1100 built walls enclosing about 100 hectares.[83] Its population was probably about 15,000. The total for these cities is about 60,000 persons. If we assume that as metropolitan cities they contained 1½ per cent of the total population of Germany, the German population should have been about 4 million by 1100.

Germany developed rapidly before the Black Death both within the older settled territory and by expansion into Slavic lands. It proceeded to a peak in the late thirteenth century, possibly continuing to increase less markedly in the first half of the fourteenth century. The thirteenth century saw a tremendous development of cities, especially in Silesia, Lausitz, Bohemia, and Moravia.[84] If we set up tentative metropolitan cities,

De magnatibus urbis Mediolani (ed. Novati, *B. Istituto St. Italiano* **20**) and the *Manipulus Florum, R. I. S.* **11**: 712.

[77] For evidence: Beloch, *BI;* Macerata **2**: 74–75, Poggibonsi **2**: 163–164, Palermo **1**: 119–121, Pisa **2**: 161, Imola **2**: 84, Florence, Lucca Siena **2**: 27 ff., Naples **1**: 170. For Padua: G. Luzzato, La popolazione del territorio Padovano in 1281, *Nuovo Arch. Veneto* **3**: 373–383, 1902.

[78] Bologna's wall built in 1200 enclosed about 208 hectares and thus held twice as many hectares as the tenth century wall which enclosed 115 hectares (map by A. Zannoni: James, E. C., *Bologna,* 208, London, 1909). The fourteenth-century wall enclosed about 419 hectares, probably including the thirteenth-century increase. An estimate for 1249 can be made from the *Registro dei Fumanti* (Archivio di Stato, Bologna, *MS III*) which shows 5,040 hearths for Porta Ravennate and 5,552 for Porta Piera. A comparison with the 1568 list (Beloch, *BI* **2**: 92, Porta Ravennate 10,881 souls, Stiera 12,149, Procula 7,316 and Piera 11,498) suggests that Bologna of 1249 had about 20,000 hearths. Since widows are listed, this total may be multiplied by 3.5 to give about 70,000. This population was still increasing since additions were being made in the time of Manfred (1250–1254) and the hearths in the bishopric increased from 16,370 to 18,800 (end of same MS). The slaves were emancipated in 1256 and are said to have numbered 5,807 (G. Rossi, *Bologna,* 76, 1924) but these were probably agricultural workers.

[79] Strakosch-Grossman, G., Die Zahl der Land Deutschlands im Mittelalter, *Deutsche Geschichtsblätter* **14**: 285–296, 1913, estimate at end.

[80] Müller-Wille, W., Zur Genese der Dörfer in der Göttinger Leinetalsenke, *Nachrr. v. d. Akad. in Göttingen, Phil-hist. Kl.,* 12, 1948.

[81] Püschel, 210 and map.

[82] Estimated from map: East, *Historical geography of Europe,* 125, London, 1948.

[83] Püschel, 176 and map; Dickinson, 138.

[84] Dickinson, R. E., The development and distribution of the medieval German towns, *Geography* **27**: 9–21, 47–53, 1942. Hoffmann, K., *Die Stadtgründungen Mecklenburg-Schwerins*

TABLE 115

SIZE OF GERMAN METROPOLITAN CITIES, THIRTEENTH CENTURY

	Area in hectares	Population estimate
Cologne	320	45,000
Magdeburg	110	16,000
Nürnberg	100	15,000
Strasbourg	193	30,000
		106,000

Sources: Püschel, 209 for Cologne, Nürnberg and Strasbourg and 210 for Magdeburg. Nürnberg's early wall included about 60 hectares, but its fourteenth-century wall held 140. We thus assume a settled area of about 100 hectares in A.D. 1200.

that is, for early thirteenth-century German lands, we should probably add a fourth for the eastward expansion, presumably Magdeburg. Nürnberg may be substituted for Regensburg (table 115). This would leave Cologne and Strasbourg as the other two centres. The combined population of these four cities should suggest that the total population of the area was about 7 million, assuming that these centres held about 1½ per cent of the total population. The time would be about A.D. 1200.

For the pre-plague period Hamburg may be added and Vienna substituted for Magdeburg. This would raise the total population estimate to about 11 million. For its 700,000 the average density would be about 16 to the sq. km. This compares with nearly 18 million of France at the same time. However, France was more fertile and enjoyed a period of relative peace, prosperity, and political centralization. Germany underwent a period of decentralization during this time while its prosperity was fostered in some areas by the rise of such great houses as Hapsburg and the establishment of the leagues of cities.

The new mark of Brandenburg extended to the east [85]

TABLE 116

GERMAN METROPOLITAN CITIES, PRE-PLAGUE POPULATION ESTIMATES

Cities	Area in hectares	Population estimate
Cologne	320	50,000
Hamburg	204	30,000
Nürnberg	138	25,000
Strasbourg	193	30,000
Vienna	170	25,000

Source: Püschel, 211 for Strasbourg.

TABLE 117

VILLAGE HOLDINGS IN BRANDENBURG, NEUMARK, 1337

Area	Towns	Wasted towns	Hufen
Berwalde	29	5	1,185
Königsberg	32	7	1,624
Schildberg	17	2	833
Lippehne	24		1,231.5
Soldin	18		1,117
Landberg	26		1,151
Friedeberg	40	12	1,897.5
Arnswalde	47	31	2,782
Schivelbein	20	3	814
Bernstein	17	2	758
Tentzick	10	6	640
Kallies	5		296
Bentin	8	7	512
Falkenburg	34	24	637
Guthow	29	25	366
	356	124	15,844
Massensche Heide	12		
Doltzicker Heide	6		
Tankower Heide	15		
Drisensche Heide	11		
Goliner	18		
Smolvitzer Heide	9		
Schiltberger Heide	—		
Hohe Heide	6		
	77		
Total towns	442		

Source: see note 85.

of the Oder and was surveyed in 1337 (table 117). About a third of the areas were wasted by warfare, but presumably the homesteads were numbered even if they were wasted at the time. There were 15,843 homesteads for 365 of the villages: to the other 77 villages might be assigned 3,342, which would give 19,185 for the total Newmark. The area of the Newmark was apparently about 10,600 sq. km. If the homesteads are multiplied by 4 (since no cotters are given) the total population would be about 76,740 and the average to the sq. km. would be 7.2. This would be a low average of course for the area was a frontier which had not been settled very long.

The great Slavic territory to the east is not easy to estimate for population. The recent researches upon Polish population, reported by Dr. M. M. Fryde in Appendix B, show careful study if some divergence in results. Its territory, about 200,000 sq. km., probably held a little less than a million in the tenth century and about 1.2 million in the period just before the Black Death. This is at variance with the experience of Polish neighbors to the west. It is so even for the district about Chelmno in a very fertile part of the

in der Kolonizationszeit vom 12. bis 14. Jahrhundert, 153, Schwerin, 1930.

[85] Behre, O., *Geschichte der Statistik in Brandenburg-Preussen*, 21, Berlin, 1905. The data have been published: von Raumer, G. W., *Die Neumark Brandenburg in Jahre 1337*, map at end, Berlin, 1837.

Vistula basin.[86] About 1200 its population density was estimated at about 10 to the sq. km. which then rose to 33 by the Black Death: the number of villages increased from 105 in 1222 to 362.

The population movement is clear enough in certain areas and still uncertain in others. It grew very rapidly in Britain, France, Italy, Germany, Poland, and Hungary. Apparently the numbers tripled in the period, the steepest climb being in the Middle Ages. The rise is, in fact, so fast that many will probably find difficulty in believing it—was there not too much disease to permit such a rise? Nevertheless, the evidence is about as clear as evidence can be for that period.

If we ask why, then it may be attributed largely to the technical developments in the field of agriculture which permitted a smaller area to support a family. And on the negative side the age was probably the healthiest of the Middle Ages—no bubonic plague, small cities until the fourteenth century, long experience and growing immunity to tuberculosis.

However, population seems to have remained static in the semi-nomadic and irrigated areas: North Africa, Egypt, Syria, and possibly Asia Minor. The latter, it will be recalled, may have seen a slowly rising population. The reason here seems reasonably obvious: little water. That is clear from the reports of the Nilometer and probably is true of the rest of the area. Granted that political chaos made the agriculture and pastoral husbandry difficult, it may be that conditions were more favorable to the semi-nomadic world with its uneasy ways than to the more permanent settlements of the sedentary regions.

Of recent years a school of thought has suggested that the population decline began, not in 1348 with the plague, but a generation earlier.[87] The evidence is that the movement of prices and wages at this time indicates a decreasing population. It is true that the famine of 1315–1317 was a rather grim one. The loss in population of what must have been 10 per cent in a few months at Ypres,[88] while probably not representative of what occurred generally in Europe, indicates that famine mortality was a serious factor. However, famine nearly always eliminates the weaker persons and thus reduces the burden of caring for the less effective members of the community. The direct evidence seems to show, however, that population continued to rise until the Black Death although the rise was slow as the increase leveled off.

[86] Paradowski, J., *Osadnictwo w Ziemi Chelminskiej*, 149, Lwow, 1936, summary in German and in tables.

[87] Postan, M., Some economic evidence of declining population in the later Middle Ages, *Econ. Hist. Rev.* **2**: 235, 245, 1949–1950; Helleiner, K., Population movement and agrarian depression in the later Middle Ages, *Canadian Jour. Economics* **15**: 373, 1949.

[88] Lucas, H. S., The great European famine of 1315, 1316, and 1317, *Speculum* **5**: 368, 1930. 2,794 deaths from May through October, 1316.

X. RENAISSANCE EUROPE, 1348–1550

Like the second of the periods which we have already covered this period begins with an attack of plague. As in the earlier period the plague struck again and again over a half-century at least. Following this era there was a surprisingly slow recovery, probably slower even than that of the seventh century. By the end of the fifteenth century in many places population was increasing, in a few places rapidly. This period is favored with more demographic information than the three earlier periods. The chief source is the extensive records of the hearth tax which was a popular tax during most of the time. There was also the very excellent information presented by the English poll tax of 1377 which must have included two-thirds of the people, while some of the German cities show instances of total population surveys.

1. IBERIA

The population of Iberia in the last quarter of the thirteenth century may well have been about 8.3 million since it was apparently about the same as it will be found about 1450–1550. There was probably a considerable rise in the half-century before 1348 and then a fall afterward. The peak may be estimated at about 9.5 million. The study of population in the period 1348–1550 falls into three geographical divisions according to the political divisions of Portugal, Aragon, and Castile (including Granada). The Kingdom of Aragon together with Catalonia was in the Mediterranean current of documentation. Their records were much like those of Italy and France; their hearth tax records go back even farther than the first attack of the Black Death. The national records of Castile and Portugal really begin, as far as demographic data are concerned, only in the sixteenth century. This would be less unfortunate if one could be certain that the population movements were the same in all parts of the peninsula. The parts of Spain conquered by the Castilians included some of the most populous areas and might not have increased as rapidly or have declined as much as the rest of the peninsula.

When the hearth tax records are published, especially for the year 1330, it will be possible to make a more accurate estimate of what the first attack of the plague did to Spanish population.[1] There are a few scattered items of interest. Huesca is alleged to have had 1,347 houses in 1284 and only 616 in 1495.[2] Another case is that of Viana. In 1307 there were 167 *vecinos*

[1] An edition of the Libros de Fuegos of 1330, 1350, and 1366 is promised by F. Javier Uranga. The Aragon list of 1495 has been studied by A. Jimenez Soler, La población aragonesa, *Primera conferencia económica aragonesa* **1**: 337–348, 1933 and in his *Historia de la económica política en Aragón*, 1947. This information is from Lacarra's report on Spain: IX Hist. Congress, *Actes* **2**: 42.

[2] Kowalewsky, M., *Die oekonomische Entwicklung Europas bis zum Beginn der kapitallschen Wirtschaftsform* **5**: 325, 1911.

TABLE 118

PAYMENTS (QUINTALS) FOR SALT TRAFFIC, CATALONIA, 1346–1363

	1346–1347	1362–1363
September	562	462
October	457	410
November	114	178
December	232	201
January	805	225
February	224	118
March	927	470
April	775	534
Total	4,096	2,598
Without January and March	2,364	1,903

Source: Barcelona, Archivo de la Corona de Aragon, *MSS 2190, 2193.*

present at an official act.[3] Usually about 60 per cent of a city were among the lawworthy and responsible families, which should have given Viana about 278 *vecinos* at the time. In 1366 Viana had a population of 265 *vecinos* of which 65 were Jews, leaving about 200 Christian male citizens. Thus the decline, if our figures are correctly interpreted, would have been from 278 to 200 *vecinos* or about 28 per cent for the first two plagues, about the rate of decline that England had.

The records of payments on the movement of salt offer interesting data for Catalonia in the period of the plague. Our assumption is that the use of salt bears a fairly constant relationship to the total number of persons in an area. The records of payments by *carradores y amolentarjos* remain in fragmentary form for a few years, given by day and month. Unfortunately only one parallel set remains for a month before and after, those of September of 1346 and 1352.[4] This shows payments on 562 *quint.* (quintals) for the former month and 443 for the latter, a decline of about 21 per cent. Since the amount was rather irregular by month this one item is not too informative. If the comparison is made between payments by months in another series the following results (table 118).

Unfortunately it is impossible to recover the complete returns for the entire years. If the gross totals are compared there is a decline of about 37 per cent from 1346–1347 to 1362. However, much of the loss is occasioned by the unusual amounts in the two months of January and March. If these are not included the loss is only about 20 per cent. The abnormal import in those two months of 1347 may, however, be merely a matter of transport or supply. The 40 per cent decline is about what was experienced elsewhere, but is a little high. The example is an illustration of the difficulties of using data of this kind for the study of population. The trend falls in line with what would be expected, but non-demographic factors have apparently twisted the figures. Furthermore, the longer in time the series run, the more such factors are apt to influence the results. Later series show a change in the system so that their figures can hardly be compared with the earlier ones.[5]

TABLE 119

ALLEGED LOSSES IN NAVARRE, FOURTEENTH TO FIFTEENTH CENTURIES

Places	Date	Original number	Now left	Vol. Page of reference
Arriz	1422	40 *vecinos*	8	I 35
Azagra	1411	80–100	30	I 77
Baigorri	1416	30	9	I 80
Corella	1392	150 *moros pecheros*	5	I 258
Genevilla	1418	100 *fuegos*	30	II 7
Tudela	1386	500 Jewish *pecheros*	200	II 116
Marañon	1393	200	20	II 301
Marcalain	1431	12	2	II 302
Mendavia	1385	100	10	II 316
Tafalla	1425	180	100	III 355
Aranguren	1423	80	3	IV 27
Ayechu	1388	109 *fuegos*	10	IV 61

Numbers are of vecinos unless otherwise mentioned.

Source: Yanquas y Miranda, J., *Diccionario de antiqüedades del reino de Navarra*, Pamplona, 1840, largely from the archives of Pamplona.

TABLE 120

POPULATION OF BARCELONA, 1359–1516

Date	Total hearths	Quarter de la Mar	Quarter Pi	Quarter of Friars Minor	Quarter St. Pera
1359	7,651				
1378	7,295				
1389	6,764	2,042	2,012	1,621	1,089
1399		2,249			
1448	(6,770)		2,011		1,100
1464	(8,222)	2,165	1,124 (34 div.)		
1516	6,860–7,546				

Sources: 1359: Smith, R. S., *Speculum* **19:** 497, 1944. 1378: *ibid*, from *Cortes de Cataluña* **4.** 1389: Barcelona, Municipal Archives, XIX, **5.** 1399: *ibid.* **6.** 1448: *ibid.* **7.** 1464: Smith, *op. cit.*, 398. This assumes 337 blocks of which 100 are in the de la Mar figures and 34 in the others. 1516: Barcelona, Municipal Archives, XIX, **15.** 321 districts are given. The higher figure is based on the assumption that there were 337 blocks.

One source consists of the complaints made by various Navarrese cities of their great losses (table 119) which must in most cases have been from the pre-plague level. Probably many of them are exaggerated. For instance, Cascante in 1436 claimed that it had been reduced in number from 300 to 40. An inquisition revealed 48 *vecinos*, 3 *pecheros*, 7 women married to *hidalgos* (and

[3] Yanquas, *Diccionario* **3**: 493. (See table 119.)

[4] Barcelona, Archivo de la Corona de Aragon, *MS 2190* (1346–1347), *MS 2191* (1352–1353), and *MS 2193.*

[5] Compare, for instance, these three manuscripts (2090, 2091, 2093) with *MS 2202* (1384–1385) and *MS 2209* (1404–1406).

TABLE 121

COMPARATIVE POPULATIONS FOR PLACES NEAR RIBAGORZA, ABOUT 1470 AND 1553

Place	Folio in MS	Number in 1470	Number in 1553	Place	Folio in MS	Number in 1470	Number in 1553
Albies	62r	2	4	Perrarua	63v	30	39
Sesue		5	11	S. Liestra		7	12
Sus, S. Martin in		7	3	Berganuy		7	7
Torre de Sera		9	10	Tolba		23	24
Sampere		8	8	Benabarri		98	92
Ballester		10	9	Lascuarre	64r	35	44
Sant Quilez		3	4	Obiergo		5	6
Panyello		9	12	Olvena		14	14
Piedrafitta		1	3	Pobla de Castro		23	28
Valle de Benasp		18	10	Bollornia		19	18
Noals		7	11	Castro (Capella de)		3	4
Senur		5	5	Peralta, Peraltiella		3	3
Gabas		5	6	Calasanz		10	7
Doz	62v	2	2	Pueyo de Merquillan		9	9
Aguilar		5	8	Casterlinas		9	5
Guel		26	16	Aler		9	5
Bonifons		6	8	Cajeras		24	11
Calvera		11	12	Purras, Puy Rey		25	18
Castro (rit)		3	4	Camporels		33	25
Yerdago		10	12	Castellon Rey		20	22
Centenera		8	12	Najan		13	15
S. Esteban de Mall		11	14	Bebils	64v	7	7
Benavent		9	9	Peralta de la Sal		23	62
S. Martin de Urri		4	6	Zorita		4	3
Pobla de Fontana		30	20	Gabusa		14	13
Fons	64r	43	82	Jusen		31	27
Calasanz		7	7	Rocafort		5	6
Crist		14	14	Estada		13	6
Castigualant		12	15	Estopaña	65r	42	20
Benasque		60	56	Balbonans		7	8
Cartamesa		32	34	Arrason		20	12
Ribera de la Cana		1	1	Castellon de Sus		12	13
Ardanuy		2	3	Pallarol		3	3
Aren		73	64				
Bergany		13	7	Total		1,141	1,177
Sobre Castell		16	13	Ratio		96	100
Capella		23	52				
Laguares		21	22				

Sources: see notes 8–9.

therefore able to pay), and 9 Jews. Thirty-seven workers had left the place. There were said to have been 250 thirty years before. In this case, of course, even the fifteenth-century loss had been considerable.[6] It would seem to show that the plague losses, even if exaggerated, had been severe.

The figures for Barcelona (table 120) which seem to be about the best for Spain in the period show a curve which is much like that of England. The initial figures, for 1359, come after the first epidemic of the plague. This epidemic may well have reduced the population of the city about a fifth or from about 9,564 to 7,651 hearths. This assumes that the number of hearths might be reduced along with the total population. It may, of course, have merely reduced the number of persons to a hearth with a minor reduction in the number of hearths. However, the drop following later plagues gives the impression that the number of hearths was sensitive to the plague also. In any case the recovery was about as rapid as in England. The decline in the country districts from 1359 to 1378 was about 3.5 per cent or somewhat less than for the city in which the decline was 4.6.[7] The figures are very important in that they show that Barcelona followed the decline illustrated by the British pattern.

In the Academy of History, Madrid, is an interesting document[8] dealing with the area of Ribagorza in Aragon. The watermarks show the pages to be of about 1480,[9] and, of course, the writing was probably

[6] Yanquas **4**: 100.

[7] Smith, *op. cit.*, table 120, 496.

[8] Colección Salazar, *MS A–9*, fos. 62r–66v. Compare with places in the *Censo de población*, 135–137.

[9] There are two watermarks. One is of a hand with fingers closed and a star attached to the middle finger. The mark appears at Palermo about 1482 and Genoa about 1483. Briquet, C. M., *Les Filigranes* **3**: nos. 11,154; 11,162 and 11,611. The

TABLE 122

SPANISH POPULATION ESTIMATES, FOURTEENTH–SEVENTEENTH CENTURIES

Area	Date	Number and units	Multiplier for total	Population estimate
Aragon	1495	52,238 houses	4.5	235,071
	1603	70,984 houses	4.5	319,428
Catalonia	1359	84,000 hearths	3.5	294,000
	1381	78,572 hearths	3.5	275,002
	1492	estimate		300,000
	1553	65,394 houses	4.5	294,273
Navarre	1366	12,263 hearths	4	49,052
	1492	estimate		92,500
	1553	30,833 houses	4.5	138,748
Valencia		97,372	3.8	370,014

Sources: Aragon—*Censo de Población*, 126, 137; Catalonia—*Censo de Población*, 143 and notes 10–12; Navarre—*Censo de Población*, 160 and Yanquas 58–59.

not much later. Now in comparison with the 1553 figures the gain in population is not great (from 1131 to 1177). If these figures are typical of all Aragon, the great gain between 1366 and 1603 must have been largely registered between 1553 and 1603.

The figures for the province of Catalonia are even more interesting. Its population in 1359 was about 84,000 hearths.[10] By 1381 it had dropped to 78,572.[11] This should have been near the bottom of the decline caused by the plague. Yet the population revealed by the tax of 1553 is only 65,394 houses.[12] The drop is so great that it suggests a decline of population well into the sixteenth century. The figures for Barcelona indicate no further decline in the city as a result of the plague.

The lack of information about Castile is in rather marked contrast to the more abundant information about its eastern neighbor. Some evidence is presented by taxation which may indicate at least partially demographic conditions, for the fifteenth century.[13]

Rentes del—1390	24,780,000 reales
1406	26,550,000
1429	23,065,270
1474	3,540,000
1477	2,390,000
1482	12,711,591
1504	26,283,334

The low figures reveal a state of very marked disorganization and hardly reflect population increase in the 1470's. Even after the reestablishment of strong government under Ferdinand and Isabella the amount only returned to the levels of the early fifteenth century. It would seem then that probably population had not changed much in the century in Castile and Aragon.

Upon the basis of official data Thomas Gonzalez estimated the population at various times between 1492 and 1594.[14] The estimates given in table 123 differ somewhat from his and will be explained in detail. Earlier the reasons for selecting 3.8 as the index number for the *vecino* and 4.5 as the index for the house were given.[15] The estimates, however, fall in line with Gonzalez' belief that the population fell in the period. The census of 1530 is omitted because it is so obviously incomplete with respect to the taxpayers. Not only are the figures very low but they include a preposterous number of widows.[16] It is assumed also that the very

TABLE 123

ESTIMATES OF POPULATION OF CASTILE, SIXTEENTH CENTURY

Area, Date	Number and title of units	Index	Total
Estimate of 1492			
Castile, 1492	1,500,000 *vecinos*	3.8	5,700,000
Granada *ca.* 1490	80,000 *vecinos*	3.8	304,000
Moors (except Granada)			200,000
			6,204,000
Estimate of 1541			
Castile, 1541	1,169,203 *vecinos pecheros*	3.8	4,442,971
Basque provinces			267,461
Hidalgos-Asturias	45,000	3.8	171,000
Hidalgos-Castile	108,358	3.8	411,760
Clergy			169,300
Moors			365,000
			5,827,492
Estimate of 1578 (by ecclesiastical dioceses)			
Seville, Toledo	*almas*		1,218,662
Almeria, Jaen	37,757 *casas*	4.5	169,906
Rest	991,683 *vecinos*	3.8	3,768,395
Moors			361,596
			5,518,559
Estimate of 1594			
Castile	1,340,320 *vecinos*	3.8	5,093,216
Basque provinces			267,461
Hidalgos-Asturias			171,000
			5,531,677

other watermark is described as "char a deux roues." Something very similar appears at Lucca in 467 and Catania in 1475. Briquet **1**: nos. 3,547 and 3,548. Briquet has some interesting remarks upon the latter.

[10] Mayer, E., *Historia de las instituciones sociales y politicas en España y Portugal* **1**: 93–94, Madrid, 1925. The data are in the *Cortes de los antiguos reinos de Aragon* **1**, 2nd part: 714–728; **2**: 55–134.

[11] Barcelona, Archivo Hist. de la Ciudad, *MS xix 4*.

[12] Colmeiro, *Historia de la económica política de España* **2**: 9; Mayer, *op. cit.* **1**: 93–94.

[13] *Memorias de la real Academia de la Historia* **6**: 154, 1821.

[14] *Censo de población*, 393.

[15] See p. 53.

[16] Sevilla, for instance (*Censo de población*, 84), shows 6,634 *vecinos pecheros*, 2,229 widows, 66 minors, 74 poor, and 79 exempt: Toledo (*Censo de población*, 71) has 23,979 *vecinos pecheros*, 4,533 widows, and 1,969 minors.

TABLE 124

ESTIMATE FOR IBERIAN POPULATION ABOUT 1492

Area	Subtotal	
Castile		6,204,000
Kingdom of Aragon		997,585
Catalonia	300,000	
Navarre	92,500	
Aragon	235,071	
Valencia	370,014	
Portugal		1,128,700
		8,330,285

comprehensive survey of 1594 included the houses of the clergy as well as those of the laity. Certainly if they were included in the census of 1587 they should be included in 1594 or *vice versa*.

The first estimate is subject to several qualifications. The date in the original document, once at Simancas, has been read as either 1482 or 1492.[17] Since the document gives the impression that Castile was holding Granada at the time, it seems difficult to place it earlier than 1492.[18] The author of the estimate based it, as he says, upon his own count. Now Alfonso de Quintanilla was the *contador* of the kingdom and possibly the co-author of measures leading to the establishment of the system of *hermandades* within the army.[19] There were apparently great collections of documents upon which he would have been able to make such an estimate. Little reason exists then to question his estimate, particularly since it seems to fall into the general trend of Castilian population of the period. This would give the peninsula a total population at the end of the fifteenth century of about 8⅓ million people.

The Basque population in the provinces of Alava, Guipuzcoa, and Viscaya is estimated at 267,461 (table 125). Alava in 1557 had 16,400 *vecinos*.[20] Probably at the same time [21] Guipuzcoa had 2335.7 *fuegos*. Since a little later part of the same province had 503.5 *fuegos* to 2,804 *vecinos*, the proportion should have been 1 *fuego* to 5.57 *vecinos*, and the total of *vecinos* for Guipuzcoa should have amounted to 12,986 *vecinos* or 49,347 persons. Viscaya in 1708 had 11,228 11/12 *fogueras*.[22] If we assume that the population had risen there as elsewhere the population of Viscaya should have been about 10,000 hearths in the late sixteenth century or about 45,000 persons. These estimates may be compared with the census of 1797. Either the population of the last two grew very rapidly in the two centuries or the calculation for the sixteenth century is quite wrong. The latter seems the more probable since the basis for an estimate is not very solid. Under these circumstances it seems best to assume that Guipozcoa and Viscaya increased in the same proportion as did Alava and to substitute such a figure for the sixteenth-century estimate for those two provinces.

Let us take up the problem of the number of the Moors in the period. It is assumed that they are included among the *vecinos* of Granada because they number 304,000 souls in 1490,[23] while the four bishoprics (Granada, Almeria, Malaga, and Guadix) only seem to have 173,780 people, presumably Christians.[24] The difference in number, that is 130,220, ought to be Moors. This assumes that the Jews had been converted by this time. Now the count of Moors of 1587 was 231,376 but it failed to include the ecclesiastical province of Granada. We assume that the Moors of 1587 numbered about 361,596. The problem probably concerns a dwindling population so that we use round numbers, 365,000 for 1541 and 200,000 for 1492, believing that they are not far wrong. In general, the chances are that the Mohammedan folk declined in numbers with the pressure exerted upon them by the Christians during the period.

The population of Iberia suffered by the treatment of the Jews in this period. Although they were banished from Castile in 1492 they had been subjected to increasing pressure since the middle of the fourteenth century. An estimate of the number in Castile before the plague was more than 300,000. By 1474 the number had declined until there were but 10,022 families which must have represented a total population of about 40,000.[25] The Jews in Navarre numbered about 423 families or perhaps 1,700 persons, or only about 3½ per cent of the population.[26] While there is reason for belief that the percentage of Jews is not reported, being included with the Christians, it is unlikely that the

TABLE 125

BASQUE POPULATION ESTIMATES

		1797	*Ca.* 1600
Alava, 1557	62,320	65,523	62,320
Guipozcoa	49,347	104,491	205,131
Viscaya	45,000	111,436	
			267,451

[17] The first by Gonzalez who published the document in the *Censo de Población*, 94, 393 and the other by D. Clemencin who published it earlier in the *Memorias de la real Academia de la Historia* **6**: 602, 1821.

[18] "Sin lo que hay en Granada."

[19] *Memorias* (as in note 17) **6**: 135, 1821.

[20] *Censo de población*, 388, 392.

[21] *Ibid.*, 122. One guess is that the population was about 13,808 *vecinos* or 60,696 persons. *Ibid.*, 159.

[22] *Ibid.*, 123–125. Another guess is 69,666. *Ibid.*, 159.

[23] Compare *ibid.*, 89. 71,904 in 1594.

[24] Counting 4.5 for the *casas* of Almeria (3476) and 3.8 for *vecinos* of the others (45,468).

[25] Amador de los Rios, J., *Historia social, política y religiosa de los Judíos de España y Portugal* **3**: 170, Madrid, 1875. 451,000 maravedis at 45 a head.

[26] Yanquas, *Diccionario de antigüedades del reino de Navarra* **2**: 725.

TABLE 126

POPULATION (HEARTHS) OF PORTUGAL ABOUT 1527

Province	Number of hearths	Area in sq. km.
Alemtejo	48,304	24,390
Algarve	28,410	4,850
Beira	66,804	24,000
Entre Minho e Douro	55,099	7,226
Estremadura	65,482	17,800
Traz os Montes	35,686	11,116
	299,785	

Sources: the figures for all except Algarve come from London, B.M. *MS Add, 20,959*. The water mark on the paper is of the same time as that of the data, about 1527. See C. M. Briquet, *Les filigranes*, Leipzig, 1923, under *main*, III, no. 10709 ff. and compare with watermarks on fos. 67v, 86v, etc. The estimate for Algarve is based on the assumption that it would have about 1527 the same relationship with the Alemtejo that the two had in 1890. Then Alemtejo had 388,000 and Algarve, 228,000.

number of Jews was more than 10 per cent of the population. Even by 1386 the Jewish community of Tudela asked to be relieved of taxation because their numbers had dwindled from about 500 to 200 and were even lower by 1435.[27]

The first good survey of Portuguese population is from 1527 and exists in a manuscript in the British Museum. The evidence is given in numbers of hearths by cities, villages, and provinces. The summary of provincial figures (with Algarve missing) is in table 126. The number of hearths (*cazaes*) for Lisbon is given as 13,080, a rather larger city than might have been anticipated. As this is well within the sixteenth century, the hearths should probably be multiplied by about 4.5 and thus the population estimate for all of Portugal would be about 1,349,033.

An estimate for Portuguese population of 1422 is 1,008,000.[28] The source is not given, but it may well represent hearths at 5 apiece, or a total of 201,600. This would assume about a 50 per cent increase from the early part of the fifteenth century to the end of the first quarter of the sixteenth century. The energetic activity of Portugal in the period would be consonant with such an increase. However, the average to the hearth in 1422 probably was less than it was a century later. If we assume that 4 to the hearth was proper, the total would be about 806,400. The greater part of the increase probably occurred during the latter part of the period. It would probably be reasonably correct to assume that the population of Portugal was in the neighborhood of one million in 1492.

From a peak of perhaps 9.5 million just before the Black Death the population dropped in Iberia to 9 or below in the succeeding fifty years remaining much the same for the fifteenth century. Then, with some exceptions,[29] the several parts of Iberia commenced a further decline in marked contrast to the general European development. What caused the difference in trend? The great migration of farming people into the New World could well be a factor since it probably carried over some hundreds of thousands. Furthermore, it could have been important only in the second half of the sixteenth century. The squeezing out of the Jews and Mohammedans was probably a more vital factor. Many of the skilled artisans left early. Such persons normally support not only their own family but require a second family to provide for their economic needs. The loss of several hundred thousand Jewish and Mohammedan skilled families would create a potential loss of employment for about the same number of Christians. Probably the migration to America concealed the loss and the inherent economic decline was staved off for a time by the influx of gold. The situation is worth studying with these possibilities in mind.

2. NORTHWEST EUROPE

The evidence about the population of France, Britain, the Low Countries, and Scandinavia is uneven but of some volume. The Peter's Pence seems to have demographic value for Scandinavia but not in England where it had been the same for centuries. The hearth tax supplies information also in France although it tended to crystallize without reference to actual numbers. In England the poll tax of 1377 was one of the best guides to population, if not the best for a large area, in the Middle Ages. Upon it the population may be estimated at about 2,232,000 persons.[30] Then a mass of data for individual manors and for the age of people enables one to form some opinion about population change although it is disappointing for part of the fifteenth century. The Low Countries were well covered by a series of hearth and other taxes during the period.

As mentioned above, the poll tax of 1377 shows an English population of about 2,232,000. Now from a study of the mortality of the plagues it is possible to follow the decline of population through the plagues with the number after each plague as follows:[31]

Number in 1348	3,757,500
After 1348–1350	3,127,500
After 1360–1361	2,745,000
After 1369	2,452,500
After 1374	2,250,000

[27] Yanquas, *op. cit.* **2**: 116.

[28] In *La Grande Encyclopédie*. Of course, the number may be merely a guess, but it does give about the number which might be expected.

[29] Galicia was apparently an exception. Ruiz Almanza, J., *La población de Galicia*, 39–41, 55, 69, 79, 121, 123, Madrid, C. S. I. C., Instituto "Balmes" de Sociología, 1948. For belief that the population increased in the interval: Braudel, F., *La Méditerranée et le monde méditerranéen à l'époque de Philippe II*, 353–359, Paris, Colin, 1949; Hamilton, E. J., The decline of Spain, *Ec. Hist. Rev.* **8**: 169–179, 1938.

[30] Russell, *BMP*, 146.

[31] *Ibid.*, 260–263.

From 1377 the population probably continued to decline until it reached a bottom not much above 2 million at the end of the century. The evidence of succession of generations [32] shows an upturn about 1430 but this evidence deals, of course, mostly with the nobility, gentry, and wealthier folk. By 1545 it would seem that the population had climbed back to 3.22 million [33] but was still some distance from the pre-plague number. The Celtic areas are harder to follow: a very tentative estimate is in table 127.

FRANCE

The great hearth tax of 1328 would show that France under the king had about 13½ million and the area incorporated in France of 1794 about 17½ million. Probably the Black Death found a slightly higher population. The evidence from a scattering of places has been included among the data which illustrate the devastation of the plague.[34] In general it shows a reduction of about 40 per cent. The course of the plague's effect after the initial attack and the trend of the population in the fifteenth and early sixteenth centuries must be treated through a series of samples. The larger portion comes from Burgundy, Normandy, and Languedoc. While these are widely scattered they were also among the areas most affected by warfare in the period. The archives of many of the French cities and departments will doubtless reveal much more about the population of the period.

The number of hearths attributed to the 35 parishes of Paris in 1328 was 61,098 which, as we have seen, is probably a mistake for 21,098. When Charles VI built a wall in the second half of the fourteenth century he enclosed only 439 hectares. This was at a low point of French strength and taxation and thus probably represents a minimum of population for the city: at 125 to the hectare the city would have had about 55,000. By the end of the fifteenth century France had recovered. The Venetian reporter [35] states that those who make the smallest guess about the population of Paris place it at 300,000. In 1535 Marino Giustiano thought that it was about the size of Venice (which had about 150,000 then). By 1545 Marino Cavalli thought that it was the largest city in Europe and numbered 500,000 while in 1558 Giovanni Soranzo guessed that Paris had 400,000 but admitted that the French claimed more. Yet when Francis I added to the area of the city he enclosed a total of less than 500 hectares. It still had mostly two and three story houses even in the more thickly settled parts [36] and probably had few more than 100,000 persons before the middle of the sixteenth century.

TABLE 127

POPULATION ESTIMATES OF BRITISH CELTIC AREAS

Area	1377	1545
Wales	125,000	250,000
Ireland	500,000	7–800,000
Scotland	348,750	687,500

Source: Russell, *BMP*, 360–362.

TABLE 128

POPULATION OF TOULOUSE, 1385–1430

	1385	1398	1405	1430
Taxables	2,749			900
Exempt	2,992			843
	5,741	5,179	4,789	1,743
Estimated laity	22,964	20,716	19,136	
Estimated clerks and univ. students	3,000	3,000	3,000	
	25,964	23,716	22,136	

Source: Professor P. Wolff most kindly permitted me to see the manuscript of his book on Toulouse of this period.

Toulouse, which had had a great history as capital of Languedoc, and with an inhabited area of perhaps 289 hectares before the Black Death [37] must have had a population of between 40,000 and 50,000. It declined rapidly after the onset of the plague and seems to have maintained the decline past the middle of the fifteenth century (table 128). These are Professor Wolff's estimates, based upon a careful study of the evidence. He finds natural difficulty in accepting the 1430 figures.

Very good data remain for Burgundy (see table 129) and have been in print for many years. They give indications in regard to the trends in eastern France which are probably significant for all of that area in spite of the fact that Burgundy was practically independent at the time. The population seems to have dropped until near the end of the century and remained relatively stable until the middle of the fifteenth century. From then on population increased sharply until the end of the century, probably continuing well into the next century. The rich archives at Dijon can probably be made to yield more information about demographic conditions before 1550.

The decline in the Cotentin is well illustrated by returns of the tax of 1365, apparently collected by the English.[38] The total for 50 villages is only 836 or 16.7

[32] *Ibid.*, 236–243.
[33] *Ibid.*, 270–281.
[34] See pp. 43–44.
[35] See table 48.

[36] See illustrated map edited by J. Cousin, Paris vers 1551 by O. Truschet et G. Hoyau. One copy is in the Welsh National Library, Aberystwyth, Wales.
[37] Estimated from map in Dickinson, 110–111.
[38] Paris, B. N. *MS fr 25,902*, doc. 11. "Parties des fouage de la viconte de Constant. renduz au terme de la S. Mich. ccclxv (*sic*). Sergenteries de S. Lo, Roger le Prevost, du Hommet, de S. Paer et Jehan de la Haille."

TABLE 129

POPULATION CHANGE IN BURGUNDY, FOURTEENTH–FIFTEENTH CENTURIES

Area	1376–1381	1391–1397	1423–1442	1461–1490	Pages
Dijon city	2,353 ('76)		1,761 ('31)	2,522 ('69)	15, 27, 66
Dijon, bailliage	6,277 ('75)		5,811 ('31)	9,825 ('69)	8, 25, 66
Beaune		565 ('91)	474 ('31)	637 ('70)	18, 50, 97
Nuits		108 ('91)	80 ('31)	142 ('70)	18, 59, 101
Beaune-Nuits siége		3,608 ('91)	3,668 ('31)	4,823 ('70)	17, 50, 85
Auxois, bailliage		6,633 ('97)	6,903 ('42)	7,725 ('61)	102, 118, 150
Auxois et d'outre Saône, Comté			3,041 ('42)	8,052 ('90)	202–11
Chatillonais	5,127 ('80)		3,699 ('23)		179, 186
	1.22	1.01	1.00	1.51	

Sources: the page numbers are to: Garnier, J., *Le recherche des feux en Bourgogne aux XIVe et XVe siècles*, Dijon, 1876. Each period is compared with comparable figures for 1423–1442. Additional items are from *Collection des inventaires-sommaires des Archives Départmentales* etc., Cote-d'or, archives civiles—serie B, Dijon, 1878, especially B 11,505 and B 11,506 for Beaune.

hearths to the village. However, the document says that this was rendered at the Michaelmas term which suggests that it is just half of the total. This would raise the average to about 33 to a village which would still be about a third of the pre-plague population, a product of the English devastation as well as of the plague. This devastation is clear in this and succeeding documents in the collection.

A very interesting collection of documents from Normandy and Meaux gives some insight into the effects of the plagues up to 1385–1395.[39] These documents come from all parts of Normandy and would seem then to show in 1328 the average for the area,[40] that is about 83.5 hearths to the parish. Now the 85 parishes considered have some 3,889 hearths or 45.8 to the parish. This gives Normandy of 1385–1395 only 55 per cent of the population of 1328. However, the presence of 6 parishes with less than 16 hearths suggests that these are so small as to affect the total more than they should statistically.[41] If these are set aside the 79 others have an average of 48.7 which would then show a loss of 41.1 per cent for the area. In either case the loss for the area was in line with the English evidence for the period.

Some evidence gives an interesting light upon the state of population in Normandy in the early part of the fifteenth century. The data are in table 130. The roundness of these thirteenth-century figures creates some suspicion but the numbers are within easy comprehension and probably are, if anything, exaggerated. This would tend to show that, despite the Hundred Years War, the parishes of at least this part of Normandy had recovered as well as England had. Its population of about 1413 was approximately that of 1236.

In theory it should be possible to use the data in a collection of returns in the Bibliothèque Nationale to follow the course of population in France. This would assume that the documents had a distribution by chance both geographically and in size of parish. A sampling (table 131) shows a varying average to the parish. However, a check of a sample seems to show that many of the places could be in Normandy and that most of them are. Now Normandy was torn up by the fighting of the Hundred Years War [42] and doubtless was reduced in its taxation potential as a result. But the non-taxables are listed, *mendiants* as well as the *miserables*. This sample would show a more rapid rise in Normandy between 1446 and 1482 than between 1485 and 1548. The

TABLE 130

NORMAN SITES, THIRTEENTH AND FIFTEENTH CENTURIES

Name	Hearths 1236–1244	Hearths—date
Grand-Couronne	120	153–1413
Grand-Quevilly	80	85–1413
Buglise	60	55–1404
Bautot	50	68–1413
Butot	55	28–1407
Maromme	100	56–1413
Boos	100	130–1414
Périers-sur-Andelle	198	228–1413
Bretot	100	49–1403
La Folletière	40	28–1398
Quevillon	60	92–1413
St.-Pierre-de-Manneville	100	100–1413
	1,063	1,072

Source: Beaurepaire, *op. cit.* (table 107), 425 ff.

[39] Paris, B. N. *MS fr 25,902*, docs. 31–35, 37–38, 40–53, 55, 58, 61–65, 69, 71, 73–87, 91, 93–97, 100–102, 104, 106–109, 114, 116, 118–120, 126, 129–134, 138, 140–143, 145, 147–149, 151 153, 155–156, 159, 62.

[40] That is, for Constantin 642 and 64,307; Rouen 602 and 60,637; Meaulx 293 and 33,836; Caen 978 and 51,205; total 2,515 and 209,985.

[41] Docs. 42, 71, 75, 84, 118, and 131.

[42] On the desolation: Denifle, H., *La desolation des églises en France vers le milieu du XVe siècle*, Maçon, 1897, 1899.

TABLE 131

PARISH POPULATION IN NORMANDY, 1385–1552

Years	Average to parish	Number of document
1328	83.5	
1385–1495	45.8	25,902
1398–1401	56.4	25,904
1420	31.7	25,906
1443–6	37.0	25,910
1458	44.7	25,913
1482–1485	51.0	25,920
1499–1501	50.73	25,925
1518–1520	49.47	25,931
1548–1552	53.4	25,938

low ebb caused by the war would naturally end with the cessation of hostilities causing an immediate revival. This, in turn, might stimulate the economic revival artificially far beyond the normal recovery experienced by other parts of Europe at the time. However, the revival still left Normandy in a less satisfactory position from the standpoint of population than it had been before the plague.

Interesting figures remain for Aix-en-Provence for the period (table 132). The number varied year by year, often considerably, so that one suspects that the collectors used their discretion as to the number who should pay. However, the sum obviously was not fixed and thus presumably has a real association with the hearths. The decline from 1336–1337 to 1356–1357 was about 35 per cent, a very heavy decline, but some of it may have occurred even before the plague since the population of 1340–1341 was probably less than

TABLE 132

POPULATION OF AIX-EN-PROVENCE, 1325–1460

Date	Number of document	Number of hearths
1325–1326	B 1587	1,280
1336–1337	B 1590	1,604
1340–1341	B 1591	1,464
1356–1357	B 1600	955
1456–1457	B 1617	647
1458–1459	B 1618	672
1459–1460	B 1618	610

Sources: *Inventaire-sommaire des Archives Départementales* etc., Bouche-du-Rhone, Archives civiles—serie B (Chambre des Comptes de Provence) **2**: 95–108, Marseilles, 1879 under number of document. For 1340–1341 the number is secured by dividing 68 *l* 12s 6*d* by 11.25*d* (assuming a *pite* was a fourth). The 1356–1357 was secured by dividing 44 *l* 15*s* 3*d* 3 *pites* by 11.25*d*.

that four years earlier. The further decline before the middle of the fifteenth century seems in line with the poor condition of southern France of the period.

The scattered evidence about the population of France would show a pattern of change surprisingly like the English. The bottom in both countries was in the decades from 1380 to 1420 and in the neighborhood of 60 per cent of the pre-plague figures. However, the French advance after 1460 would seem much faster than the English if the Caen and Burgundy evidence is a trustworthy sample of the total. It is a little hard to believe that by 1500 French population (1794 area) had again reached 15 million. On the other hand, the expansive force of the French in the late fifteenth century may well have been based upon a rapidly increasing population.

TABLE 133

POPULATION OF BRABANT, FIFTEENTH–SIXTEENTH CENTURIES

	1437	1464	1472	1480	1496	1526	Hectares
	Maisons						
Total	92,738	91,957	85,527	86,483	75,343	97,013	989,287
Quartier de Louvain	22,934	20,567	19,056	19,441	11,990	11,118	141,274
Quartier de Brussels	23,651	24,944	22,882	23,005	18,030	26,072	211,067
Quartier de Antwerp	28,337	29,039	26,689	27,875	28,770	37,532	374,000
Quartier de Bois-le-Duc	17,747	17,966	16,900	16,162	16,553	20,843	265,642
Cities							
Louvain, I.M.	3,579	3,296	3,306	3,697	2,818	3,418	424
E.M.				236	251	162	
Brussels, I.M.	6,376	7,165	6,731	6,468	5,152	5,815	1,007
E.M.				946	595	867	5,899
Antwerp, I.M.	3,440	4,459	4,510	4,932	5,960	9,527	2,262
				514	626	802	
Bois-le-Duc, I.M.	2,883	2,335	2,351	2,930	3,099	4,338	1,759
					357	446	

Sources: quartiers data from Cuvelier, 484–486 except for Antwerp from xxii; for Louvain 432–433, Brussels 446–447, Antwerp 462–463, and Bois-le-Duc 476.

THE LOW COUNTRIES

In 1374 a tax on adult persons of sufficient income was levied in Brabant. Cuvelier has estimated that the total population was about 350,000, which estimate is probably accurate. The number of adult taxables was about 136,098. It did not include the poor (given in 1437 as about 24 per cent)[43] or the servants (estimated by Cuvelier as about 10 per cent.[44] This should give the total adult population at about half again the number of taxables—say 204,147. Now the children of Ypres, probably the place most nearly comparable, of about that time were rated at about 42.5 per cent of the total population. If we assume that the definition of child was about the same, the Brabant population of 1374 should have been about 355,038.[45] We should expect it to have been higher than that of the first half of the fifteenth century as we shall see the estimate makes it. However, the household of the time should have consisted of about 3.5 persons and thus the numbers of hearths should have been about 100,000.[46]

In his very careful study of the late medieval hearth taxes of Brabant, Cuvelier could find no example of the number of persons to a house in that duchy.[47] He did show that the Brabantine house, like most medieval houses, in the period was quite small even in the cities and housed only a family.[48] He thus refused to set up an index number.[49] In general since the poor were included and there was no pressure for housing, one may assume that the index number would be between 3.5 and 4 to a hearth. The climate of Brabant was, like England's, not sufficiently rugged to drive grandfather or even grandmother from her cottage to the house. Probably the increasing cold of the climate led to building warmer houses as the fifteenth century moved on. At Ypres the number of persons to the house increased: 3.3 in 1412, 3.6–7 in 1437, 4.3 in 1491, and 4.1 in 1506. We are suggesting then the following (table 135) as the population of Brabant.

There is much information about other parts of the Low Countries at the end of the fourteen hundreds, as given in the figures below. It is assumed that Flanders, like Brabant, would have about two-thirds of its population in the cities, while Hainault would be somewhere between Brabant and Luxemburg and have about a sixth in the cities. The hearths are multiplied by 3.8, the index chosen for Brabant of the period of 1472. The total population is over a million.

Data come from the Duchy of Luxemburg in 1473 and 1495. Even in 1495 it seems that serf holdings were regarded as half-hearths for purpose of assessments.[50] This was very certain by 1501.[51] Nevertheless, the drop from over 18,500 in 1473 to about 12,400 must have been the result in part of declining population. There was probably a rise by 1537 when the number of hearths was about 14,000.[52] The population of the cities should have remained on about the same

TABLE 134

POPULATION ESTIMATES OF BRABANT, 1374–1526

Year	Index	Houses	Population estimate
1374		100,000	355,038
1437	3.6	92,738	333,586
1464	3.7	91,957	340,241
1472	3.8	85,527	325,003
1480	3.8	86,483	328,635
1496	4.0	75,343	301,372
1526	4.2	97,013	407,455

[43] Cuvelier, xcii.
[44] *Ibid.*, lxxxviii.
[45] The children thus would include those up to about twenty years of age. This is reasonable since the tax was fairly heavy and would normally be borne only by those getting adult wages.
[46] Cuvelier (xcii) assumes 4.5 to the hearth and thus gets a smaller total.
[47] *Ibid.*, lxix.
[48] *Ibid.*, lxii–lxviii.
[49] *Ibid.*, lxxciii. He finally suggests 500,000 for 1526 which is 5 to the house. *Ibid.*, cccxxvii.

TABLE 135

POPULATION ESTIMATES OF LOW COUNTRIES, 1469–1514

Area	Date	Rural hearths	Total hearths	Population estimate
Brabant	1472	57,094	85,527	325,003
Luxemburg	1501	14,000	15,500	58,900
Holland	1514		45,857	174,257
Flanders	1469	73,938	110,892	419,389
Hainault	1469	29,212	35,054	123,205
				1,100,754

Sources: most of the data in IX Hist. Congress, *Rapports* 1: 62 n. 28. Luxemburg, Grob, J., et J. Vennerus, *Dénombrements des feux du duché de Luxemburg* etc., Brussels, 1921. Holland, Unger, W. S., *De Economist* 1: 1913; Naber, J. C., *Bijdragen van het Statistisch Instituut* 4: 1885; Fruin, R., *Informacie up den staet.*, Leiden, 1866. Flanders, de Smet, J., Le dénombrement de foyers en 1469, *B. Comm. roy, d'Hist* 99: 105–150, 1935. Hainault, information supplied to authors of the *Rapports*, IX Hist. Congress by M. Arnould.

TABLE 136

POPULATION OF LUXEMBURG, 1473–1495

	1473	1495
German quarter	13,654	9,145
Walloon quarter	4,915	3,276.5
Total hearths	18,569	12,421.5

Source: Grob et Vannerus, *op cit.* (table 135), 2.

[50] Grob et Vannmerus (see table 136), 92.
[51] *Ibid.*, 499.
[52] *Ibid.*, 482.

TABLE 137

LUXEMBURG POPULATION, CITIES, 1473–1537

City	1473	1495	1501	1525	1528	1537
Luxemburg	500	461	470	400	399	369
Arlon	235	200	200	170.5	177	176
Thionville	280	295	307	243	260	253
Echternach	233	137	127	162.5	177.5	154
Bastoigne		171	150	108	120	161
Marche		100	140	92	80	104
Carignan		190	151	63	43	55
Total		1,554	1,545	1,239	1,256.5	1,272

Source: Grob and Vannerus, *op. cit.*

basis throughout the period since their inhabitants were free, but seem to have recovered more slowly than the countryside. The 1473 figure should have been multiplied by 4.5 presumably and thus produces a total for the duchy of about 83,561. If the area included was about 10,000 sq. km. the average was about 8.4 to the sq. km. It included then an area greater than the present duchy and province of Belgium since it has lost some territory to France since then.[53]

SCANDINAVIA

The data for Scandinavia are not very satisfactory for the post-plague period. Upon the basis of the Peter's Pence it is assumed that the population of Norway following the plague was about 93,086 and of Sweden about 162,240.[54] This represents slightly less than 60 per cent of the pre-plague population. Applying the same reduction to the estimates of pre-plague Finland and Denmark gives the following result and total for Scandinavia immediately after the plague, about A.D. 1400.

Denmark	105,500
Finland	35,100
Norway	90,750
Sweden	106,560
	337,910

The Scandinavian countries probably were more in the pattern of Britain than of Germany and may be assumed to have risen in population to perhaps about a half-million persons by the end of the Middle Ages. It must be admitted that this is a rather rough guess.

3. THE EMPIRE

The Holy Roman Empire was by the fifteenth century a rather loose confederation under the Hapsburgs but at the very end of the century occurred one effort at imperial taxation. The Diet of 1495 agreed to a tax presented by Maximilian I with sufficient poll-tax features to enable one to use it for demographic purposes. It was to be levied at the rate of 24 persons above the age fifteen to the gulden. The emperor expected 150,000[55] which indicates a population over fourteen of about 3,600,000 or a total population of 5,400,000. This would be from an area of probably 600,000 sq. km.[56] and thus would have a density of about nine to the sq. km. This contrasts sharply with an estimate of 15 million for A.D. 1400. Probably more can be done with the accounts of this tax if they are still at Frankfurt am Main. Lacking these, samples of population may be examined to see if there was a density of only 9–10 persons to the square kilometre.

The population of Switzerland, still in theory a part of the empire, has been estimated as follows:[57] 600,000 in A.D. 1300 and 600,000 to 650,000 thousand in 1400. The first is a pure guess probably wrong, since the population of 1300 should probably be higher than that of 1400. With the fifteenth century more satisfactory evidence is available.[58] The data can be broken down in detail as in table 138. One chance item (for Vallorbe) gives 21 hearths for 1371 and 14 for 1403, about the usual ratio.[59] In the calculations the data which seemed non-comparable (places which differed in size from one time to another) were omitted. In general the story is consistent. The population was slowly falling at 1411–1416 but was stabilized before 1445 and remained static past the end of the century, being in 1516–1518 about what it had been a century earlier. There followed a rapid rise just before the middle of the sixteenth century. The density of the population was about seventeen to the sq. km. in 1411–1416, assuming 5 to the hearth. It may well have been about 4.5 which would give a density of about 15 at the time. The area of Switzerland was about 38,850 sq. km.

Applying the density of population of western Switzerland to all of that country may well exaggerate its numbers since some of the eastern part is very mountainous. Nevertheless, even the Tirol shows a steady increase in population from 1,538 hearths in 1312 to between 2,089 and 2,438 hearths in 1427.[60] It would

[53] Map in *Enciclopedia Italiana* under "Lussemburgo."

[54] See pp. 54–55.

[55] Ulmann, H., *Kaiser Maximilian I,* 393, 394, Stuttgart, 1884; Jung, R., Die Akten über die Erhebung des gemeinen Pfennigs von 1495 im Stadtsarchiv zu Frankfurt a. M., *Korrespbl. d. Gesamtvereins d. Geschvereine* **57**: 328–335, esp. 330–331, 1909.

[56] Keyser, *BD,* 180, 204, 247. Some of the data from this tax are given: von Inama-Sternegg, K. T., *Deutsche Wirtschaftgeschichte* **3**: 432–433.

[57] Bickel, W., *Bevölkerungsgeschichte und Bevölkerungspolitik der Schweiz,* 37 ff., Zurich, Büchergilde Gutenberg, 1947; Mayer, K. B., *The population of Switzerland,* New York, Columbia Univ. Press, 1952.

[58] Used in: Ammann, H., Bevölkerung der Westschweiz, *Festschrift F. E. Welti,* 390–447, Aargau, Hist. Gesell. des K. Aargau, 1937.

[59] *Ibid.,* 424.

[60] *Quellen zur Steuer-, Bevölkerungs- und Sippengeschichte des Landes Tirol im 13. 14. und 15. Jht.* Redlich Festschrift, Eightieth Birthday, 6, Innsbruck, 1939.

TABLE 138

POPULATION TREND IN SWITZERLAND, 1411–1558

Number of places	Number of hearths at specified times					
	1411–1416	1445–1458	1470	1481	1516–1518	1557–1558
159	11,827	10,984				
8	223		218			
23	914			862		
59	3,059				3,211	
26	2,058					2,597
58		4,455				5,880)
						(1.31)
33				933	957	
					(1.03)	
23					2,216	3,307
						(1.49)
Ratios 1–5	1.00	.93	.98	.94	1.05	1.26
Ratios 6–7 (corrected)					.97	1.23
Density to sq. km.	15	14	15	14	15	22
Population estimate (1,000's)	480	446	470	450	480	615

appear that somehow the Black Death did not strike here as hard as it did most other places.

Some of the local data from the imperial taxation of 1495 are interesting. The bishopric of Salzburg at that time probably had about 13,000 sq. km. and a population of about 57,425.[61] The payment of 1,543*l* 2*s* 18*d* was made by 32,317 persons, thus about 21 persons to the gulden. The very mountainous character of the area explains the rather low density of 5 to the sq. km. This included the city itself estimated at about 7,000. The evidence for Basel shows a city of about 9,000 and a countryside with perhaps 3,225 (2,150 taxed),[62] in an area of about 285 sq. km. The countryside thus averaged barely more than 11 to the sq. km. The countryside of the Duchy of Mark showed in 1532 a density of about 16–18 to the sq. km.[63] in the rather rich Rhineland.

The tax returns for Mecklenburg in the north of Germany of 1496 remain, giving about 40,000 persons.[64] Presumably the area covered was the eastern half of

[61] Widmann, H., Die Einhebung der ersten Reichssteuer im Salzburg im Jahre 1497, *Mitt. d. Ges. f. Salzburger Landeskunde,* 91–106, 1910. He gives 52,825 as a sum because he assumes that the population under fifteen was only one-third of that over fifteen instead of the more exact one-half. The Register is in the city archives of Frankfurt am Main, no. 2,449.

[62] Ammann, H., Die Bevölkerung von Stadt und Landschaft Basels am Ausgang des Mittelalters, *Basler Zs.* **49**: 25–52, esp. 37, 48, 1950.

[63] Weber, C. L., *Die Anfänge der Statistik in der ehemaligen Graftschaft Mark bis zur Jahre 1609,* 11, 69, Witten, 1909. Area of 2,600 sq. km. and population of 43,186 or 45,547.

[64] Keyser, *BD,* 247, probably from: Stuhr, F., *Die Bevölkerung Mecklenburgs am Ausgange des Mittelalters, Jbb. d. Ver. f. mechlenburgische Gesch.* **58**: 232, 1893.

TABLE 139

ESTIMATE OF POPULATION OF SORAU, 1381

	Unit	Number	Persons to unit	Total
Sorau (city)	hectares	11	50	550
German	*Hufen*	764		
Flemish	*Hufen*	514		
Cottars	families	150		
Total	families	1,428	4.7	6,712
				7,262

Sources: Schultze, J., *Das Landregister der Herrschaft Sorau von 1381,* xvii, xxxi, Berlin, Brandenburgischer Landbücher **1**: 1936. Area of Sorau in Keyser, DS **1**: 645–646.

Mecklenburg since the western and northern cities of Schwerin, Wismar, and Rostock are not mentioned. The area then should be about 8,320 sq. km.,[65] which is an average of less than 5 to the sq. km. A total for all of Mecklenburg of the same time would seem to be about 130,000.[66] This probably included the whole area of about 16,000 sq. km. In this case some, if not all, of the cities, were probably included and yet the average to the sq. km. is still not 10. Even in the rather populous area about Göttingen the average was as low as 17 about 1450.[67]

TABLE 140

ESTIMATE OF POPULATION OF MIDDLEMARK, 1375 AND 1450

Area	1375					1450	
	Villages			*Hufen*	Cottars	*Hufen*	Wasted H.
	No.	Wasted	No data				
Barnim	179	9	1	8,835	2,077		
Nieder						3,319	212
Hohe						4,196	752
Havelland	108	3	2	3,679	874	2,697	119
Teltow	74	1	1	2,808	500	2,740	228
Zauche	84	2	—	2,427	564	2,200	241
Total	445	15	4	17,749	4,015	15,152	1,552
Ukermark	187	16	34	7,511	2,715		

For 1375 the number of villages for Altmark is given as 316.
For 1450 the Hufen for Glien are given as 923 and 127 and for Rhinow as 132 and 5.

Sources: Behre, O., *Geschichte der Statistik in Brandenburg-Preussen,* 29 and 40, Berlin, 1905. Data are published in: Schultze, J., *Das Landbuch der Mark Brandenburg von 1375,* Berlin, Brandenburgische Landbücher **2**: 1940.

[65] Estimated from map "Germany 1254–1500" in *Encyclopaedia Britannica,* 11th ed.

[66] Grotefend, H., *Deutsche Geschichtsblatter* **10**: 21, 1909–1910.

[67] Müller-Wille, W., Zur Genese der Dorfer in der Göttinger Leinetalsenke, *Nachrr. v. d. Akad. d. Wiss. in Göttingen,* 14, 1948.

TABLE 141

HOLDINGS IN THE MIDDLEMARK, 1565

Division	Villages	Cottars	Hearths		Area of *Hufen* (sq. km.)
			Hufen	*Koss*	
Nieder Barnim	94	1,688	831	857	3,094.5
Hohe Barnim	73	1,657	959	698	3,215.5
Havelland	121	2,270	1,251	1,019	3,056.5
Teltow	84	1,253	760	493	2,550.5
Total		6,868	3,801	3,067	11,917
Total A.D. 1450					12,952
Total A.D. 1375				3,451	15,422

Source: Behre *op. cit.*, 45.

The land register of Sorau of 1381 gives some interesting information about that territory at the height of the Black Death (table 139). The *Hufen* were apparently family holdings. The size of the family may be guessed from a bit of information, that 150 cottars had 200 sons. Doubling for the women would show a total of 700 persons for these 150 families or about 4.7 to these families. The rural families number about 1,428 with a total of about 6,712. To these the population of Sorau the city must be added. It is assumed that a rural city would have a density of about 50 to the hectare. Since there were 657.8 sq. km. in the area the average is about 11 persons to the sq. km.

If we multiply the number of *Hufen* and cottars (21,764) by 4.7 we have 102,291, the farm population of the Mittelmark. This for its 10,985 sq. km. gives it about 9.3 to the sq. km. However, probably a fifth should be added for the city populations which would raise the total to 122,749 and the average to the sq. km. to 11.3. For 1450 the only direct comparison with 1375 is the number of homesteads. This has fallen off 15 per cent which should mean that the population has an average of about 9.6 to the sq. km.

A little over a century later another calculation can be made for the area. If we take the same areas we have the information in table 141. The situation is puzzling. The cottars increase in number, but that increase is offset by the fact that at the end only 3,801 hearths appear on nearly 12,000 *Hufen*. It should mean a still further decline from the days when presumably there was a family (and hearth) on each *Huf*. It has been estimated that all of Brandenburg at this time had about 264,017 persons [68] which for its area of about 231,200 sq. km. should give about 8.5 to the sq. km.

The late medieval German cities might be expected to yield very valuable information about total population since so much research has been devoted to them.[69] Yet much still remains to be done before one can get accurate information about population of those cities. Take, for instance, the cases of Augsburg, Stralsund, and Ulm. In the two long lists of cities with late medieval population these three are given respectively 18,300, 15,000, and 20,000.[70] Yet, another method of calculation for Augsburg shows a figure near 12,000 as late as 1498,[71] while Stralsund and Ulm are given the areas of 45 and 74 hectares.[72] Since it is rather unlikely that either would have had more than 200 to the hectare at most, the former's upper limit should probably be 9,000 and the later 14,800 while the chances are that the actual population was smaller (6,000 and 9,000). Except in the few cases where total population is given, one should consider the possibilities that estimates should be scaled down considerably, depending to some extent upon the patriotism of the compiler. Most of the figures seem to have been prepared by honest scholars with strong local connections.

Unfortunately, the application of the metropolitan city method to Germany involves certain difficulties. The first is that some of the largest German cities can be estimated with great difficulty. The largest was apparently Cologne which had had since the pre-plague period an area of over 300 hectares but even in the middle of the sixteenth century had only 31,000 in-

[68] Behre, *op. cit.*, table 141, 45.

[69] See p. 11.

[70] Keyser, *BD*, 264–265, 313–314; Reincke, H., Bevölkerungsprobleme der Hansestädte, *Hansische Geschichtsblätter* **70**: 1–33, esp. 6, 1951.

[71] See p. 52.

[72] Püschel, 210–211.

TABLE 142

POPULATION (THOUSANDS) OF CITIES OF LATE MEDIEVAL GERMANY

Expected percentage	Western cities		Central cities		Eastern cities		Northern cities	
100	Cologne	30	Nürnberg	23	Prague	30	Hamburg	22
57	Strasbourg	20	Augsburg	18	Vienna	25	Lübeck	18
38	Frankfort	10	Zürich	11	Breslau	14	Bremen	18
30	Trèves	9	Regensburg	10	Frankfurt a. O.	10	Brunswick	18
24	Wismar	7	Basel	10	Stettin	9	Magdeburg	12
20	Mühlhausen	7	Ulm	9	Brno	8	Rostock	8
18	Mainz	6	Salzburg	7	Görlitz	8	Osnabrück	5

Sources: table 65. In some instances estimates based upon areas have been substituted for manifestly high guesses. For Prague: Davies, A., Morphology of medieval Prague, *Proc. Leeds Phil. Litt. Soc.* **5**: 202–208; Schurer, O., *Prag*, 1935; Dickinson, 197–198.

habitants. Since cities changed position markedly between the plague and 1550 [73] the population about 1500 is not easy to estimate. Two possible metropolitan centres were Vienna and Prague. The former had a late medieval area of about 170–180 hectares and the latter probably about 200.[74] Both may well have been near 30,000 in population. On the other hand, Lübeck the great Hanse city is said to have had an area of only 107 hectares [75] so that, instead of the 30,000 usually assigned it, it actually had only 18,000–20,000. Furthermore no one city seems to stand out sufficiently to justify being considered the metropolis of all of Germany. It is not easy to pick out four or five.

Tentatively let us set up four districts together with what seem to be the largest seven cities of the district (table 142). If we assume that Cologne, Nürnberg, Prague, and Hamburg are the four metropolitan centers and that their population (105,000) roughly estimated, constitutes 1½ per cent of the total population of the empire, that population should be about 7 million. This is not far from the estimate based upon apparent density of population. If we take the population of the twenty-eight cities (392,000) and assume that this estimate should contain about 4.3 per cent of the total, we have an estimate of about 9 million for the empire. This may indicate that the population of some of the cities is overestimated or that the disorganized state of Germany does not produce a pattern of cities which might be expected. Perhaps the Hanseatic League's commerce created larger populations in the northern cities than was justified by the empire's population. A fair estimate of the population would seem to be in the neighborhood of 7 million in the first half of the sixteenth century. The poor conditions there seem to preclude the idea of a rising population in Germany.

ITALY

Italy provides more information about population after the 1348 epidemic than any other country except England and in many ways its evidence is more satisfactory from the standpoint of trends than the northern country. Much has been studied by Beloch and published in his two volumes. On the basis of rather comprehensive data the estimate for about 1550 can be established. There is less material for the two preceding centuries but sufficient to make a fairly satisfactory estimate of the population of about 1500 and at the low point during the era of the plague.

The population estimate for about 1550 would be then about 8,850,000. The data in table 143 would indicate a relatively stable population from about 1420

[73] See comparative figures in Reincke, *op. cit.*, 6, for the early and middle periods of the fifteenth century.

[74] For Prague see map in Dickinson, 197–198 and for Vienna, *ibid.*, 185.

[75] Püschel, 210; Reisner, W., *Die Einwohnerzahl deutscher Städte in früheren Jahrhunderten mit besonderer Berücktigung Lübecks*, 45–46, Halle, 1902.

TABLE 143

ESTIMATE OF POPULATION OF ITALY ABOUT 1550

Place and date	Population estimate	Division estimate
Piedmont	600,000	
Milan, 1542	68,490	
Milanese, 1541	215,844	
Genoa, 1535	50,000	
Ligure, 1531	78,938	1,013,272
Parma, 1545	19,532	
Parmese	97,123	
Pallavicini	25,502	
Piacenza	26,800	
Piacenza, contado	97,633	
Guastalla	10,400	
Modena	18,000	
Modena, distretto	16,456	
Reggio	12,594	
Reggio, castellanze	17,739	
Reggio, distretto	14,741	
Mantua	125,000	481,560
Venice, 1540	131,000	
Venetia	600,000	
Friuli, 1548	780,058	1,511,058
Papal States	1,533,014	1,533,014
Tuscany	912,700	912,700
Naples	2,110,150	2,110,150
Sicily	850,000	850,000
Sardinia	184,380	
Corsica	63,829	248,209
Italy		8,659,963

Sources: Piedmont, estimate. Milan, Besta, B., La popolazione di Milano nel periodo della dominazione Spagnuola, *Proceedings*, Rome **1**: 594. 11,415 fuochi times six. Milanese, Besta, E., I censimenti Milanesi de Francesco II Sforza e di Carolo V, *ibid.* **1**: 584. Genoa, Felloni, G., Per la storia della popolazione di Genova nei secoli XVI e XVII, *Archivio St. It.* **110**: 237, 1952. Ligure, Gorrini, G., La popolazione dello stato Ligure nel 1531, *Proceedings*, Rome **1**: 532. Parma, etc. to Piacenza, Solmi, A., Sulla storia della popolazione del ducato de Parma e Piacenza, *ibid.* **1**: 617–620. Compare Beloch, *BI* **2**: 243, 159. Guastalla, Modena, Modena, distretto, proportionately one-fifth less than in 1600. Beloch, *BI* **2**: 259, 267, 274. Reggio had 13,774 in 1630. Proportionately the castellanze should have had about 10 per cent less. Beloch, *BI* **2**: 270, 274. Venice, Beloch, J., *Bevölkerungsgeschichte der Republik Venedig, Jbb. f. Nationalök u. Statist.*, 3rd ser. **18**: 24; La popolazione di Venezia nel secoli XVI e XVII, *N. Archivio Veneto* **1**: 5–49, 1902. Friuli, Fortunati, P., La popolazione friulana da secolo XVI al giorni nostri, *Proceedings*, Rome **1**: 114. The population increased in four centuries (XI–XVI) from 198,613 to the above number. Leicht, P., La popolazione delle città e terre friulane nel 500, *Proceedings*, Rome **1**: 611–615. Papal States: about 90 per cent of 1650 figure, assuming it increased midway between the advance of Naples (84 per cent) and Tuscany (little change). Beloch, *BI* **1**: 212; **2**: 237. Sicily, Beloch, *BI* **1**: 152. Sardinia, estimate of half-way between 25,512 hearths of 1485 and 66,669 hearths of 1603 multiplied by four. Corridore, F., *Storia documentada della popolazione della Sardegna*, 53, Torino, 1902. Corsica had 116,053 hearths in 1686. Borlandi, F., Per la storia della popolazione della Corsica, 94–95, 1942. If its development was proportional to that of Sardinia it should have had the number given since Sardinia had about 61,645 in 1686. Italy, Beloch's estimate appears in La popolazione d'Italia nei secoli XVI, XVII, XVIII, *Bull. Inst. Intern. Statist.* **3**: 181, 1888.

TABLE 144

TREND OF POPULATION, LATE MEDIEVAL ITALY

City	Date	Population estimate (a)	Date	Population estimate (b)	Percentage of mid-16th cent estimate (a)/(b)	*BI* Beloch
Venice	*ca.* 1363–1368	65,000	1540	131,000	50	
Sicily	1374	500,000	1548	850,000	59	1: 152
Palermo	1374	4,082h	1548	15,000h	27	1: 119, 124
Florence	1380	54,747	1551	59,557	92	2: 134, 140
Prato	1390–1400	5,000	1551	6,845	73	2: 170
Arezzo	1390	1,776h	1551	1,550h	115	2: 170
Rome	1393	30,000	1527	55,035	55	2: 6
Parma	1395	20,000	1573	20,000	100	2: 238–9
Parma	1404	15,000	1573	20,000	75	2: 238–9
Massa Maritima	1408	1,600	1568	1,115	143	2: 175–6
Parma	1421	11,500	1573	20,000	58	2: 238–9
Arezzo	1423	1,166h	1551	1,550h	75	2: 170
Florence	1424	37,225	1551	59,557	63	2: 136
Arezzo	1436	1,255h	1551	1,550h	81	2: 170
Arezzo	1443	1,087h	1551	1,551h	70	2: 170
Piacenza	1447	25,000	1546	26,760	93	2: 249–50
Naples, K.	1448	230,000	1545	422,030	54	1: 212
Arezzo	1450	1,128h	1551	1,550h	73	2: 170
Florence	1458	38,865	1551	59,227	66	2: 136
Milan	1463	40,000	1542	68,490	58	
Mantua	1463	26,407	1559	36,196	73	2: 287
Mantua, con.	1463	105,000	1562	125,000	84	2: 300
Naples, K.	1465	232,896	1545	422,030	55	1: 212
Arezzo	1467	1,217h	1551	1,550h	79	2: 170
Florence	1470	40,323	1551	59,227	68	2: 136
Palermo	1479	5,109h	1548	15,000h	34	1: 120, 124
Arezzo	1480	1,274h	1551	1,550h	82	2: 170
Florence	1480	39,090	1551	59,227	66	2: 136
Naples, K.	1485	215,107	1545	422,030	51	1: 212
Arezzo	1490	973h	1551	1,550h	63	2: 170
Medola	1493	1,800	1562	3,092	58	2: 300
Catania	1501	2,798h	1548	4,907	57	1: 144
Messina	1501	31,385	1548	40,000	78	1: 136
Palermo	1501	8,000h	1548	15,000h	53	1: 120, 124
Naples, K.	1501	254,380	1545	422,030	60	1: 212
Venice	1509	110,000	1540	131,000	84	
Parma	1502	15,760	1573	20,000	79	2: 238–9
Parma	1509	19,034	1573	20,000	95	2: 238–9
Naples, K.	1510	264,916	1545	422,030	63	1: 212
Mantua	1511	27,741	1559	36,196	77	2: 287–9
Mantua, con.	1511	105,000	1562	125,000	84	2: 300
Naples, K.	1518	247,866	1545	422,030	59	1: 212
Naples, K.	1532	316,000	1545	422,030	75	1: 212
Arezzo	1533	1,377h	1551	1,550h	89	2: 170

Venice: see below, p. 128.
Milan: B. Besta, *Proceedings*, Rome I 596.

to about 1500 at about two-thirds the 1550 figure, that is, about 5½ million. The increase in the first half of the sixteenth century must have been a very rapid one. The information coming from the second half of the fourteenth century is too little and scattered to yield much about the actual trends, except that the decline from the pre-plague population must have been severe and in about the same proportion as was typical of the period.

The population of Venice should be included in the third volume prepared by Beloch which has not been published as yet. However, Beloch wrote an article upon the population of Venice which presumably will be included in the volume.[76] He estimated that Venice had in 1552 about 158,069 as the total of very full data which included men, women, children, the religious, the poor in the hospitals, and the Jews.[77] The census of 1540 he estimated to be about 131,000,[78] while the

[76] Beloch, J., La popolazione de Venezia nei secoli XVI e XVII, *Nuovo Archivio Veneto* **3**: 5–49, 1902.
[77] *Ibid.*, 10, 41.
[78] *Ibid.*, 9, 44.

TABLE 145

ESTIMATE OF VENETIAN POPULATION ABOUT 1363–1368

Sestiere	1363–1368 (Names)	1509 (persons)	1540 (persons)
San Marco		20,168	25,201
Castello	2,338		23,611
Canareggio			26,678
Dorsodure			26,274
Santa Croce		11,820	15,189
San Paolo	3,019	8,339	8,848
			125,801

much more fragmentary one of about 1509 represented about 110,000.[79] Now there is interesting information in a British Museum manuscript which covers two of the six *sestieri* of that city.[80] This paper manuscript contains about 27 folios. The watermark is defined by Briquet as "fruit en form de poire ou de figue, accompagné de quatre feuilles." The examples of the watermark coming from Venice are of the years, 1363–1368.[81] This is a very convenient date since it falls after the first two attacks of the Black Death.

The two *sestieri* are of Castello with about 2,338 names and San Paolo with about 3,019. The development of the *sestieri* may be indicated somewhat by table 145. The difficulty obviously is that S. Paolo was practically stationary in population from the fourteenth to the sixteenth century, while S. Marco, S. Croce, and Castello all seemed to be growing rapidly. The size of the other two would suggest that they also had grown rapidly. We can assume, of course, that two *sestieri* of 1363–1368 were representative of the whole city and multiply the number of names to get 16,061 as an estimate for the city. If we multiply the names by four using the Florentine example as a pattern we have a total of about 64,284. If we assume that the change in Castello is typical of the city and compare the proportion as of 1540 another estimate can be made. Castello had about 18 per cent of the 1540 number.[82] This would assume a city of about 52,000 but obviously Castello had much less than 18 per cent of the 1363–1368 population. Castello and S. Paolo had about one-fourth of the population of 1540; if they had one-fourth of the 1363–1368 number, the total should have been about 85,000. But those were certainly more than a fourth of that population. Probably 65,000–70,000 would be a fair estimate.

[79] *Ibid.*, 40.

[80] *MS Egerton 611.*

[81] Briquet, C. M., *Les filigranes* **2**: nos. 7,397–7,399, Leipzig, 1923.

[82] The names probably represent house owners. The case of S. Paolo would tend to suggest a low index number. It is hard to believe that the number of houses decreased much in the interval.

4. EASTERN EUROPE

Eastern Europe was recovering during a part of this period from the Mongolian domination which had been established in the thirteenth century. A part of it was to experience conquest by the Turks toward the end of the time. Yet it was an era of prosperity apparently for the great state of Poland-Lithuania. Russia advanced rapidly under the leadership of Moscow toward independence and continued absolutism. Although the worsening climate probably affected the area adversely, the colder weather seems to have had little effect upon the course of population development.

In contrast to the central and western German areas which seem to have declined steadily in population in the period, the city of Danzig grew rapidly, at least well into the fifteenth century. The city's growth probably resulted from the expansion of population in the Slavic lands along the Vistula as well as in the Prussian territories. At the time of the Black Death Danzig would seem to have occupied about 44 hectares [83] and at the usual 150 to the hectare should have had about 10,000 inhabitants. The number of plots (*grundstücke*) increased as below. Since the plot was probably similar to the burgage in England it should probably be multiplied by an index of between 5 and 6.[84] Five is used here since the city was new (table 146). About A.D. 1410 some 8,549 persons paid for revolting against the Teutonic Order. If the total population was about 11,000 at the time, it should have included all of those above the age of twelve, both men and women.[85] By the end of the fourteenth century the walls had been extended to include about 105 hectares and were further widened to about 260 hectares by the end of the Middle Ages.[86] At 100 to the hectare the walls should have indicated a population of about 26,000, evidence of increasing population in the fifteenth century.

The population of Poland may be estimated back from a calculation of 1578 [87] which gave the Polish cities 142,800 and the countryside 825,800, or a total of 968,600. If we assume a development approximating

TABLE 146

ESTIMATE OF DANZIG'S POPULATION, 1357–1416

Date	Grundstücke	Persons (estimate)
A.D. 1357	1,238	6,190
A.D. 1382	1,396	6,980
About 1400	1,467	7,335
A.D. 1416	2,355	11,775

Source: Keyser, E., *Danzigs Geschichte*, 34, 38, Danzig, 1921.

[83] Extent of area of habitation from Keyser, *DS* **1**: 34–35.

[84] Russell, *BMP*, 46–48.

[85] Jastrow, J., *Die Volkszahl deutscher Städte zu Ende des Mittelalters und zu Beginn der Neuzeit, 22*, Berlin, 1886.

[86] Püschel, 211.

[87] Cuvelier, xliv, citing a calculation of A. Pawinski.

that of Germany this population should not have changed much since the plague. The chief seat of Poland at this time was Cracow which had an area of about 40–50 hectares.[88] However, Warsaw even then was a rival and metropolis with a centre of 30 hectares. At 80 hectares [89] and 150 to the hectare the two should have been the centres for a population of 800,000. Against this may be placed the seemingly well authenticated evidence that the plague did not damage the population of Poland to the extent that it did Poland's western neighbors.[90] It is then suggested that its population grew at a rate which would bring it up to 2.5 million in the first half of the sixteenth century.[91]

The Angevin dynasty of Hungary was well acquainted with the hearth tax in Naples and brought it to Hungary, incorporating it in the currency reform of 1323.[92] The tax was a silver mark upon every peasant house.[93] The population in the period 1382–1494 is estimated at about 3 million persons (table 147). This is the estimate for Hungary alone rather than for the whole Hungarian Empire which covered a much larger area at the time. Since the estimate is based in part upon fifteenth–sixteenth-century data, the estimate belongs to the end of the fifteenth century. The struggle with the Turks which occurred during the last part of the period probably prevented much population increase between 1500 and 1550.

The individual numbers for some of the divisions are given as follows: [94]

Pest	4,500	Heves	5,722
Somogy	11,085	Baranya	15,018
Arva	301	Lipto	791

The revival of Russian power under the leadership of the princes of Moscow occurred in the fourteenth and fifteenth centuries. The despotism of that house tended to make their capital, Moscow, a great center. Its medieval section, in part unwalled before 1534, seems to have covered about 625 hectares.[95] Since the sixteenth-century wall enclosed a much larger area, it may be assumed that the population of the end of the fifteenth century numbered at least 150 to the hectare and thus a total of about 94,000 which suggests

TABLE 147

MEDIEVAL HUNGARIAN POPULATION ESTIMATE

Proprietors	Royal free cities	Other cities	Villages	Inhabitants	%
King	49	243	3,056	540,000	18.5
Church		92	2,558	355,000	12.1
Lay castellans		282	5,828	840,000	28.8
Great proprietors		21	1,169	150,000	5.1
Medium and small			8,600	1,035,000	35.4
	49	638	21,211	2,900,000	100

Source: Hóman, *Gli Angioini*, 280. He estimates 120 to the village, 1,000 to the royal free cities, 500 to the vassal cities upon the basis of fifteenth–sixteenth century data. This estimate he regards as a tentative minimum estimate. He calculated two families of four each to a holding instead of the late fifteenth–sixteenth century 3–8 families. See also I. Acsády, *A. magyar jobbagynépesség száma a mohacsi vesz után*, 1890.

a population of some 6 million for Russia of the day.[96] This fits in well with the belief of English visitors that it was larger than London.

5. MOHAMMEDAN LANDS

The earlier series of great lists of taxation seems not to have been continued in Mohammedan lands. One is then reduced to such information as happens to remain. We may begin with the information about the great center, Constantinople, which, as every school child knows, fell into Turkish hands in 1453.

The population of that city naturally declined as the Byzantine Empire was reduced within the grip of the Ottomans. It is not surprising that a western visitor placed the population at 40,000 in 1437 [97] and an Italian observer reported it at 30,000–36,000 at the time of its capitulation.[98] Even this population was hardly justified by the small area of Byzantine territory and was probably supported by the commercial greatness of its site. The Christian defenders and the dead in 1453 were reckoned at about 7,000 which again would make 36,000 a reasonable estimate of the inhabitants.[99]

[88] *Géographie universelle* **4** (2): 673.

[89] *Ibid.*, **4**, 2: 649.

[90] See app. B, note 3.

[91] See app. B, final paragraph.

[92] For a short account see Hóman, B., *Camb. Med. Hist.* **8**: 587–619. A longer account appears in the translation by L. Zambra and R. Mosca of: Hóman, B., *Gli Angioini di Napoli in Ungheria, 1290–1403*, Roma, Studi e documenti, Real Accademia d'Italia, 1938.

[93] Hóman, *Gli Angioini*, 182. For numbers of great family holdings see *ibid.*, 248–249.

[94] Kósary, D. G., *A history of Hungary*, 78, Cleveland, 1941.

[95] Estimated from maps in article: Fleure, H. J., Some types of cities in temperate Europe, *Geog. Rev.* **10**: 369, 1920; *Géographie universelle* ed. P. Vidal de la Blache et L. Gallois, **5**: 143, Paris, 1932. Since it was probably a caravanserai, it naturally included a great area when walled.

[96] In 1722 Russia had about 14 million (Mavor, *An Economic History of Russia*, 418–419, 1914) and thus may have had only 6 million two centuries earlier. The Russians experienced much eastward expansion and even some conquest in the interval. However, P. Miliukov estimated its population at 12 million in 1500 (Vernadsky, *Kievan Russia*, 103).

[97] Schneider, A. M., Die Bevölkerung Konstantinopels im 15 Jahrhundert, *Nachrr. v. d. Akad. d. Wiss. in Göttingen, Phil-hist. kl.* 236, 1949.

[98] Tetaldi. Martene et Durand, *Thesaurus Novus Anecdotorum* **1**: 1819–1825, Paris, 1717.

[99] de Hammer, J., *Histoire de l'empire Ottoman* **2**: 401, Paris, 1835, quoting Phranzes III, 3, 53. The Greeks numbered 4,963. Sansovino, M. F., *Historia universale dell'origene, guerre et imperio de Turchi*, 470, Venice, 1654. For other information: Charanis, P., A note on the population and the cities of the Byzantine Empire in the thirteenth century, *The Joshua Starr*

Following the capture of Constantinople the sultans made a strong effort to build up that city.[100] As the capital of a large empire it was, of course, certain to grow rapidly. By 1477 it was stated, perhaps officially, that it had 9,000 Turkish houses, 3,000 Greek, 1,500 Jews, 267 Christian from Kaffa, 750 families from Karaman, and 31 Gypsies and, if to these are added 1,152 from Galata, the total is 15,700 houses or families.[101] This should have included perhaps 60,000 persons, since the houses were said to have been mostly wood and earth, quite small and badly built.[102] It gives the impression that building materials from the Byzantine city were not abundant. A Venetian report of 1573 says that the city then had 300,000,[103] a report parallel to the belief that it had 120,000 families in 1554.[104] The Venetian reports, examined elsewhere, are usually guilty of amazing exaggeration.

The ambassador's report of 1534 throws other and probably more accurate light on the demographic situation in the Turkish Empire. He says that the head tax (*caraz*) upon Christians at a ducat a head brought in 1,500,000 ducats,[105] but that the *sangiaccato* of Argos paid instead a ducat a hearth or 200,000. That type of district was rather small—perhaps most of Greece was indicated. The provinces of Moldavia, Valachia, and Transylvania and the islands paid a separate tribute;[106] it is unlikely that they paid the *caraz* as well. The Christians east of the Bosphorus probably numbered less than a half million at most, leaving a million or more for the other European states subject to Turkey. Elsewhere the tax was said to be so heavy that women and children under twelve were exempt.[107] If the million is multiplied by three it ought to approximate the population, still mostly Christian, of what was later to be Bulgaria, Serbia, Macedonia, and possibly northern Greece.

The decline of Bagdad would seem to indicate that even the population of Mesopotamia had declined. The late medieval walls held about 562 hectares. This should give about 70,000 inhabitants and indicates somewhat less than five million for the valley.[108] There seems to be very little information about Syrian population in the period.

For North Africa during this period some items remain together with a notable description of about 1516.[109] Ibn-al-Shama estimated that in 1361 Tunis had about 7,000 houses,[110] which should give a total population of about 28,000 unless the inhabitants crowded more in each house than did Europeans of the same time. The area surrounded by the medieval wall was about 97 hectares;[111] 28,000 persons would have been crowded in the city. Tunis was certainly the metropolis of much of North Africa lying south and west of it. If it included 1½ per cent of the total population of the country depending upon Tunis, the total should have been about 1,800,000. This is considerably less than the Roman population of proconsular Africa and Byzacena, the equivalent ancient provinces. By 1516 the number of houses in the city of Tunis was estimated at 10,000,[112] a 50 per cent increase, but even this suggests a total population of the country smaller than that of Roman times. The decline may be explained in part by the encroachment of tribal, nomadic peoples in the formerly sedentary lands. Other estimates by Leo Africanus convey the impression of small population: Carthage 500 houses (Leo, 30), Asfachus 300 or 400 (Leo, 59) and Kairwan described as a ruined city.

On the other hand the sixteenth-century geographer leaves the impression of a greater population in the west of North Africa. He fails to give estimates for such great cities as Fez and Morocco, but Tagavost (I, 161),[113] Bugia (II, 2), and Constantine (II, 10) are listed with 8,000 houses, Elgiumuha (I, 164), Agmet (I, 187), Mecnase (I, 317), and Oran (I, 610) with 6,000 each. It is thus possible that Maghreb (Moslem West-Africa) west of Tunis possessed a larger population than Roman Numidia and Mauretania (estimated at 2½ million). While some descriptions of decayed Roman and even Mohammedan places are given, many more places are stated as of Moslem and probably recent origin. Tlemsen, the capital of a large emirate, enclosed about 104 hectares which probably contained a population of about 13,000.[114]

For all of North Africa a recent authority lists about 139 tribes on a map of the fourteenth century, of which 56 were Arab and 83 Berber.[115] About 1516 a Spanish memoir estimates the strength of the horsemen of the tribes of Tunis (table 148). The territories of Ouled Aoun and of Sheik Ahmed b. Requi (of the Ouled Melhel) had, it was said, 200 villages and 300 horsemen. Even if we assume that (at the same ratio) 27,000 horsemen represent 18,000 villages, it gives at

memorial volume, 135–148, New York, Jewish Social Studies Publ., **1**: 1953

[100] Sansovino, *op. cit.*, 153.

[101] Schneider, *op. cit.*, 240.

[102] *Relazioni*, 3rd series, **1**: 392.

[103] *Ibid.*, 389.

[104] Schneider, *op cit.*, 242. Since the eighteenth century city had only 88,185 houses, this is exaggerated. Schneider, *ibid.*

[105] *Relazioni*, 3rd series, **1**: 37.

[106] *Ibid.*, 38.

[107] *Ibid.*, 426. Sometime later (1554 and 1573) both Christians and Jews together were paying 2 million. *Ibid.*, 149 and 311.

[108] Budge, E. A. W., *By Nile and Tigris* **1**: 207, London, 1920. See map.

[109] Leo Africanus.

[110] Encyclopaedia of Islam under "Tunis."

[111] Estimated from: Réclus, E., *The earth and its inhabitants. Africa* **2**: 173, New York, 1893.

[112] Leo Africanus, French trans., **2**: 33–51, Paris, 1936.

[113] Leo Africanus, *op. cit.* at pages given in text.

[114] The area from Marçais, G., *Tlemcen* **4**: 82, Paris, 1950. Leo Africanus said that the city had 16,000 hearths, perhaps some exaggeration. Marçais, *Tlemcen*, 81.

[115] Marçais, G., *Les Arabes en Bérberie du XIe au XIV siècle*, 740, Paris, 1913.

TABLE 148

SHEIKS AND HORSEMEN OF THE TUNISIAN TRIBES, 1516

Tribe	Sheiks	Horsemen	Tribe	Sheiks	Horsemen
Ouled Said	8	2,700	Ouled Melhel	6	1,400
Ouled Bellil	6	1,500	Ouled Yakoub	3	1,700
Beni Helâl	12	5,250	Hannecha	2	1,500
Ouled Cheifa	4	1,500	Donâuda		10,000
Ouled Yahia	2	1,500	Total		27,050

Source: Elie de la Primaudie, Documents inédits sur l'histoire de l'occupation espagnole en Afrique (1506–1574), *Revue Africaine* **21**: 215–220, 1877. It is a memoir of Bernadino de Mendoza (Archivo de Simancas).

50 to the village only about 900,000 persons for Tunis. The tribes were in many cases small. It is doubtful whether they averaged more than 10,000 to the tribe. For 139 tribes this would give a population of 1,390,000 in the whole of North Africa. However, the sedentary areas within the control of the tribes may have been more thickly populated.

It is possible that a higher per cent of a nomadic population lived in the cities than of an agricultural society. As an estimate of sixteenth-century population for North Africa we suggest:

Tunis	1,000,000
The rest	2,500,000
Total	3,500,000

About A.D. 1600 the city of Tunis is said to have had 160,000 houses which indicates a population of about 640,000 persons. This is far too great for the city but might be either a bad guess or a reference to the population of the province about the city.[116]

Leo Africanus, who is generous with large places, gives a few estimates of Egyptian population.[117] In describing Cairo he said that its largest section, Beb Zuailla, had 12,000 houses, and of other divisions, Beb Ellich had 3,000, Bulach 4,000, and Charafa 2,000.[118] If we assume that the missing division, Gemeh Tailon, was about the same size as the smaller divisions, the total would be about 24,000 houses or perhaps 84,000 persons. However, while the area may have included as much as 700 hectares, there may have been only about 500 and even these seem to have included extensive garden areas.[119] It is doubtful that the population was more than 50,000 and it may have been less. Since the central Egyptian city seems to have been more than 1½ per cent of the total population when Alexandria was the largest in Roman days, probably the same was true of the late medieval period. A population of 2½ million is suggested. That was still the population about the beginning of the nineteenth century.

Another approach, at least to Egyptian population of the late sixteenth century, is made by the curious remark of a Spanish traveler that Cairo had 25,000[120] *porrupios*. The author came from Valencia and doubtless was thinking of the street groups of the kingdom of Aragon. Now for Barcelona[121] as sampling shows that each of its divisions had on the average about 21½ houses or 86 persons, 25,000 of them would give a population of about 2,150,000 persons. However, this result assumes that (1) the author mistook a number given for Egypt as the number for Cairo alone (something not hard to do since areas are often included with the cities) and (2) that he converted such a number into units with which he was acquainted. The number is rather close to the estimate of the preceding paragraph.

The effects of the plague were much the same everywhere that they can be tested. Upon the basis of evidence of an earlier chapter we assume a 40 per cent decline of the 1346 population, except for the drier areas, by the end of the fourteenth century. The numbers reached then were generally static well into the fifteenth century although some places declined further while others improved their position. The evidence about Mohammedan population is scant. One may surmise that the greater flow of water in the Nile caused Egyptian population to increase. Germany apparently declined on into the sixteenth century,[122] while Iberia, except for Portugal, went down in numbers. On the other hand France tended to recover, if evidence from three areas is significant, by 1470, and England possibly began its recovery even earlier. Italy experienced a sharp increase from 1500 to 1550. Nevertheless, the population of the whole area about 1500 was still markedly smaller than it had been just before the Black Death. By 1550 it had risen to about the preplague figure.

[116] *Puey Monçon*, ed. E. Saavedra, **1**: 160, Zaragossa, Colección de estudios arábicos, 1899.

[117] Estimates of other Egyptian cities are not very helpful: Barnabal with 400 houses, Thebes with 300 and Mifrulhetich with 2,000. Leo Africanus, *op. cit.* **2**: 197, 198 and 215 respectively.

[118] Leo Africanus, *op. cit.* **2**: 202, 209, 213, and 214 respectively.

[119] The map in the *Encyclopaedia of Islam* under "Cairo" suggests about 700 hectares. See also: Munir Adham, M. B., Le Caire au XVe siècle d'après les données de Maghrizi, *Bull. de la Soc. R. de Géog. d'Egypte* **13**: 160–161, 1924. The scale of the map is given as 1 to 5,000 but seems wrong. If it is 1 to 25,000 the area would be about 500 hectares.

[120] *Puey Monçon* (see note 116) **1**: 55. The number of *casas de la oración* is given as 3,600 which again would appear to indicate a country rather than a city.

[121] Sample from Barcelona, Archivo hist. de la Ciudad, *MS XIX*, vol. 15.

[122] For a good statement of conditions: Helleiner, K. F., Population movement and agrarian depression in the later Middle Ages, *Canadian Jour. Economics* **15**: 368–377, 1949.

XI. DEMOGRAPHIC THEORIES

Theories nearly always fall into two classes: rationalizations of existing situations and real policies underlying courses of action. The first are often intrinsically interesting while the second are very significant. Late ancient and medieval theories of lay action tend to be in the second class since, as has been indicated earlier,[1] population was under control and moved at the discretion of the people. The evidence gives an encouraging picture of the medieval scene since it shows that medieval society had very definite ideas about the necessity of man remaining master of his own destiny in relation to the land and to each other. It is in refreshing contrast to the fatalism and carelessness of modern populations. There will be considered Roman imperial policy, lay theories, clerical theories, and theories in regard to technology and inventions.

The evidence about these several types of theories varies widely in abundance and accessibility. The Roman imperial policy and theory have received excellent study. The general and lay theory has received little attention and, indeed, must be worked out largely from the conditions which existed in the period since the laity was not very expressive of its ideas. This is peculiarly unfortunate since these ideas were the most important demographic ideas of the period. In contrast there are many data about clerical ideas although they are scattered in manuscripts and books and have not been collected well. The information about theories with respect to technology is the most difficult to use although they are also important. It is obvious then that this chapter can be only an introduction to the subject which should eventually receive much more attention from those interested in population.

1. ROMAN IMPERIAL POLICY

The early Roman emperors felt keenly the military needs of the frontiers and the value of manpower. They preferred to have the soldiers come from the city states since they understood them. Their efforts were directed to encouraging the increase of population in general and by the founding of colonies. In the second place they desired to keep up the higher classes of the population by a series of laws bringing advantages to those who married and had children.

The belief that city colonies produced children was an understandable illusion. If a colony was founded of newly married veterans, it naturally had a tremendous birth rate since the first years of marriage bring the most children. Naturally, if an emperor visited such a colony, he would be impressed by the great numbers of children. He would probably not realize that the cities were actually the enemies of children and that the families would probably have had more children if they had returned to the native villages of the empire.

[1] See chapter II.

The effort to encourage prolificy by a long series of enactments was a failure. Augustus exempted married couples with children from certain inheritance taxes, allowed the men preference with respect to office-holding, and permitted city families to have cheap or free food. Then he forbade the unmarried to inherit at all under certain circumstances, made their taxation more burdensome, and set up heavy penalties for adultery. He permitted concubinage with legal advantages to children of such unions and extended more legal privileges to freedwomen who had children. The theory behind the imperial practice is clear. Augustus and his successors felt that their responsibility as rulers made these steps necessary. The counter theory of the irresponsible wealthy class is also obvious. It expected to enjoy its privileged position since it did not share governmental responsibility. Eventually the legislation in favor of those with children fell into disuse or was altered.[2]

Beginning with the reform of the taxation of the Roman Empire by Diocletian the theory of population was well expressed by the term, *stabilitas census*,[3] that is, stability of population with respect to tillage. The land was divided by census into areas of differing size according to economic value into units large enough to support a worker. The law recognized that population did vary and thus persons would be drawn from an overpopulated area to an underpopulated territory to keep up the specified taxation of the two areas. Yet what one should not overlook is that the stability could be quite well regulated, not merely by controlled migration, but by permitting marriage only to those who had holdings sufficient to maintain the family, and by permitting the exposure of unnecessary children. However, the problem in the later empire was not an oversupply of children but an undersupply—the peasant was more precious than the soil.[4]

As against the interest in increase in population there must always have been an interest in stable population, either a rationalization of a condition or a real appreciation of life as an adjustment to environment. This was the position of both Plato and Aristotle. The former believed that marriage should be regulated to maintain a stable population and the latter that such methods as abortion, infanticide, and exposure be used to prevent overpopulation.[5] It cannot be said that these theories were to have the effect upon scholastic

[2] Bouché-Leclercq, A., Les lois démographiques d'Auguste, *R. H.* **57**: 241–292, 1895; Stella Maranca, F., Le legge demografiche di Augusto, *Quaderni Augustei.* Roma, 1938, Studi Italiani.

[3] Piganiol, A., *L'impôt de capitation sous le Bas-Empire romain*, 27–29, Chambéry, 1916.

[4] *Ibid.*, 29–30.

[5] Gonnard, R., *Histoire des doctrines de la population*, 41–44, Paris, 1913, quoting from Plato, *Republic*, II and Aristotle, *Politics*, I, i, Plato believed in an ideal republic of about 5,040 citizens which presumably would mean a city of 18–20,000 inhabitants, as defined in his *Laws*.

thinking that other ideas of these men had in the later Middle Ages, but their thinking does fall in line with what was happening among the laity even then. Thus, it probably represents a current of thought which was very common throughout the classical and medieval world.

Aristotle also took up, what imperial theory naturally did not touch, the relationship to men and women in the family.[6] This was in a passage which will be seen later to have been carefully considered by the scholastic thinkers of the thirteenth and fourteenth centuries.

> For from the start the functions are divided, and those of man and woman are different So they help each other by throwing their peculiar gifts into the common stock. It is for these reasons that both utility and pleasure seem to be found in this relationship. But this friendship may be based also upon virtue if the parties are good, for each has its own virtue and they will delight in the fact. And children seem to be a bond of union (which is the reason why childless people part more easily): for children are a good common to both and what is common holds them together.

The emphasis is upon the common good of the family rather than upon the necessity of having children or of avoiding sin, the great objectives of the clerical ideal. It can be seen that, if a child at birth seems to have no place in the family economy, it might be allowed to die without disturbing the family conscience.

The Mohammedan world continued the classical tradition that an embryo was not inviolate from the moment of conception. The human soul, they reasoned, developed apace with the body and was therefore not complete until the body was perfectly formed. Thus, they saw little objection to abortion and even less to contraception. Their great physicians had ideas of varying accuracy upon contraception, but it is doubtful whether any but the simplest forms were practiced.[7]

2. LAY THEORY

The position of man in medieval demographic thought was much the same in clerical and lay opinion with respect to the child from his first day. He was then accepted by the family and by society. He was entitled to life, to the customary education of his group, and to a position in his society equivalent to his physical and mental abilities. He entered a class society and could expect only the rights and privileges of his class as an endowment. In time if he were able and intelligent he would become a pillar of his class community. If he were subnormal mentally he would be assigned a position, often caring for the animals, of respect and responsibility. In his old age he would be entitled to care, often as holder of a cottage, and in receipt of some income from the heirs who took over his agricultural holding. He married but first he had to have a means of support, either inherited from his family or from that of his prospective bride.

The importance of the family is obvious. It had, as stated earlier, a certain inherited position with respect to land and other property which could care for a given number of persons. The adjustment of the family to the subsistence available to it was of more importance than the idea of continuity of the family which, as a matter of fact, developed only toward the end of the Middle Ages. There was thus little pressure to have children just to maintain the family name. Now also this adjustment tends to assume either a static population or one which increases or decreases as the means of subsistence changes. This was not new to the world since regard for subsistence has usually been a primary concern of humanity.

The postponement of marriage until one had a living was one method of restricting population.[8] Since the birth rate was not much beyond the death rate for most of the Middle Ages, marriages were not long postponed. Even in the Church a clerk was not usually advanced to the priesthood until after he received a cure of souls and required that faculty. The principle held true whether on the manor or in the gilds of the city. The assumption is that man's dignity requires a proper adjustment to subsistence and even to the respect of the community. It holds up a very high standard for mankind: each man with sufficient food, clothing, and space to play his proper part in the drama of human life.

Even in the thirteenth century marriage on the manors of the Abbey of St. Albans was apparently regarded as a method of ensuring services for the present and the future. One man "paid five shillings to remain without a wife for a year." [9] A "complicated arrangement allowed Robert son of Robert atte Dune to pay the entry fee for his father's land, and for license to marry, while permitting the father to hold the land for life; the son was to marry and take his wife to the father's tenement with his consent." [10] Probably this was the normal arrangement: it assured the father his rights if the son died. The same type of arrangement was possible for a widow.[11] There is also a case where a man who refused to take the wife named by the lord was fined and the heiress was "bidden to marry herself by next Michaelmas" (September 30)—this was in May.[12] In another case "in 1269 William atte Grace was given time from May 1 to Michaelmas to provide himself a wife and was bidden to bear himself chastely meanwhile, on pain of half a mark." [13] Three weeks

[6] Aristotle, *Ethics*, VIII, 12, trans. by W. D. Ross, *The works of Aristotle* 9, Oxford, 1925.

[7] Himes, N. E., *Medical history of contraception*, 139–159, London, 1936.

[8] Homans, G. C., *English villagers of the thirteenth century*, ch. 10, Cambridge, Mass., Harvard Univ. Press, 1941.

[9] Levett, A. E., *Studies in manorial history*, 242, Oxford, 1938. Ranulph de Strode.

[10] *Ibid.*, 243.

[11] *Ibid.*, 243.

[12] *Ibid.*, 237.

[13] *Ibid.*, 236. See also the case of Galfridus Knyght. *Ibid.*, 237.

after the date had passed he still had no wife and had not brought his possession upon the manor.

The early demographic statistics coming from Augsburg in the first half of the sixteenth century [14] give interesting illustrations of the importance of positions for marriage. In the years of epidemic, 1504, 1511, and 1547, the number of marriages increased markedly. In 1504, for instance, there were 3,000 more deaths than usual and about 450 more marriages. Of the 3,000 extra deaths presumably 1,500 were of men and the same number of women. Of the 1,500 men half would be those under the median age of about twenty. Thus apparently about 450 of about 750 men were being replaced. Of the 300 many were of course cottars in the country and poor men of the city. The poor would be then about 40 per cent of the total, a proportion which appears with some consistency in the Middle Ages. On the other hand, the years of greatest epidemic, presumably those of the plague, fail to show more than the usual number of marriages; the death rate was too great for them to marry and survive in sufficient quantities to raise the marriage rate.

There was little written theorizing among the laity upon the questions of population in the Middle Ages. Lay theory must then be derived from practices of the people. The same was true for the late classical period. People did not crowd into houses, as sometimes they are supposed to have done. Thus, they had a feeling for space and their adjustment to it. Even though there was a very small excess of births over death, the surplus existed and raised the question of subsistence. The high death rate, particularly of women, cared for part of the problem, but the rest was apparently solved by the usual methods: abortion, infanticide, and exposure.[15]

Probably the attitude was produced by a sort of statistical approach to the problem. Most of the chances to produce children did not do so: birth then while a normal process was an unusual result of sexual acts. Of the many births a very large per cent of the infants died within a short time. Again survival, although normal, was not expected in most cases—too many died. Thus even before a human decision was made chance destroyed the results of many conceptions. Conception and birth were normal but were not considered too seriously. If a baby arrived, but the family saw no place for it in an already crowded cottage, it was allowed to die at birth with no qualms. The family felt that it had a right to accept or reject the child. Among the Romans the family might even adopt a man to aid in the continuity of the family. Furthermore, the appearance of defective and subnormal children gave the impression that the process of procreation and birth was faulty and thus humanity did not have always to accept the results of such a process. In lieu of documentary evidence of the thought of the nonclerical groups such a process of reconstruction of their thought would seem to lead to the above-mentioned conclusions.

This attitude of some indifference to the very young is illustrated by the lack of Roman funeral monuments to tiny children. This was only natural in a society which saw a constant procession of babies to the grave. It was better not to acquire too great attachment to them: it was too disturbing when they passed away. In these days of low infant mortality, it is hard for us to realize the constant presence of death of the young in earlier days. This attitude was, of course, to run afoul of the clerical theories which developed in the period which we are studying.

The later very low opinion of women was apparently largely induced by the clerical element in society. The heretical movements reflect more the higher estimate of woman and the naturalness of family life. Master Alan's attack on the Waldensians accused them of letting women speak in Church contrary to the Apostle's advice that women be silent in meeting.[16] Later Thomas Waldensis, a Carmelite, attacked the Wycliffites for approving of women as clergymen, for disapproving of celibacy and for saying that there should be sexual intercourse only for the purpose of begetting children.[17] These ideas, as we shall see, are very much at variance with the common ideas of the Christian Church's apologists.

3. ECCLESIASTICAL THEORY

The Church did not have a well worked out theory of population in the Middle Ages. In a large sense it was much more interested in the relationship of humanity to the next world than to this one. To the Church this world was very ephemeral which Christ's Second Coming was expected to throw into its final stage at any moment. Compared thus with timeless eternity, even the few thousand years of the earth's existence was unimportant and the problems of population adjustment a matter of indifference. The life of man, at most a few score years, was also insignificant compared to his future life. Given these assumptions, it is hardly surprising that the Church felt no necessity to consider its demographic future.

Nevertheless, the minuteness of care exercised by the Church over the lives of its members did have a certain

[14] See table 53.

[15] On exposure in the ancient world see: Barrow, R. H., *Slavery in the Roman Empire*, 8–9, New York, 1928 and literature there cited. Franks, *ESAR* 3: 11.

[16] The attack on the Waldensians is in Paris, B. N. *MS lat. 3,374*, fos. 36v–47v. The heading (fo. 1r) is "Incipit quadripartita magistri Alani edita contra hereticos." The lay character of their religion can be seen by Alan's attack on their beliefs that (1) they must obey God alone, (2) laymen should preach, (3) obey only good prelates, (4) confess to laymen, (5) churches need not be consecrated, (6) prayers for dead useless, (7) every lie a mortal sin, (8) people must not swear. (9) or kill.

[17] Paris, B. N. *MS lat. 3,380*, fos. 74v–75v, 83v and 84v respectively.

demographic significance. From Patristic times a body of theory and practices grew up which were to have important places in population history. Naturally they centred about marriage and the relations of the sexes, principally conditioned by a sense of sinfulness of such relations and the inferiority of women.[18]

Tertullian[19] gives expression to the early attitude of expectancy of the Second Coming in his treatise on chastity. The injunction, "Increase and multiply," had been given until the world should be filled. Population was like a forest which had been permitted to grow that it might later be cut down. Now the world was in its last days and one should not worry about marriage.

The important object then was to attain Heaven, a place for those who had committed little sin. In a sense, sin was equated to worldly pleasure of which, of course, sexual pleasure was one of the greatest. The Church was a man's church which naturally interpreted problems in a masculine way. Eve had sinned, and thus man had fallen. "All bad things from women," wrote Jerome in a treatise against marriage in which he gives long lists of evils and good by women but the latter mostly by saints and fewer in number than the former.[20] Women had been ordered even by Paul to cover themselves and had lost their approximate equality before Roman Law to that subordination which was to be theirs until recently. With this subordination there disappeared the ideal of equality in marriage and of woman as a partner upon equal terms in the home.

The standard approach to marriage was set up by St. Augustine. Marriage is tripartite: faith, children, sacrament.[21] Faith means that one shall be faithful and not have sexual relations outside of the "chain of marriage." In regard to children, one shall love them, accept them, nourish them well and educate them religiously. Sacrament means that one shall not separate or, being separated, shall not join another for the sake of having children. The ideal is to have children and to prevent sexual sin. There is also here (which tends to disappear for a time) an emphasis upon the place of the children in the family. There is nothing about the pleasures of home life or about the companionship of man and wife: this would tend to minimize those joys of celibacy which Augustine stresses even in his treatise on the good marriage. There is no effort to consider the family in terms of the economic opportunities which in this period would have meant their relationship to the soil.

But the Church early got away from the soil, even though its founder had discovered His early disciples among the villages of Palestine. Christianity spread from city to city and thus lost its contact with the villagers who were among the last to be converted and retained their name *pagani* as the name for the unconverted. Sometimes the earth became a symbol of sin or at least of the unreligious.[22] It is not surprising then that there occurred a separation of ideas. The religious leaders were attached to the great city churches much in accordance with the size and importance of the city. And when Augustine came to write of the ideal organization, he wrote of the City of God.

The basis of the dislike was probably in part because the earth represented fertility and was worshipped in the mystery religions of the time. Terra Mater, herself a Roman goddess, associated often with the emperors,[23] emphasized this most unwelcome aspect of paganism to the Christians. The religions of Isis and the Great Mother were regarded with dislike and suspicion by the early Christians so that the dissociation of Christianity from fertility is understandable.

An early Christian attitude in regard to marriage is expressed by John Chrysostom who was writing about A.D. 381–386 a treatise on "Inane Glory."[24] In it Chrysostom advises careful Christian training followed by early marriage after a suitable bride has been found. There is also a certain emphasis upon the succession of children trained as the father.

> Let us celebrate the wedlock without flutes or harp or dancing; for a groom like ours is ashamed of such absurd customs. Nay, let us invite Christ there, for the bridegroom is worthy of Him. Let us invite his disciples; for the groom all shall be of the best. And further, the groom will learn to train his own sons in this way, and they theirs in turn, and the result will be as a golden chain.

[18] On the latter see Laprat, R., Le rôle de la mater-familias romaine d'après Saint-Augustin, *Revue du moyen âge latin* **1**: 129–148, 1945. The modern Catholic view is given by Riquet, M., Christianisme et population, *Population* **4**: 615–630, 1949.

[19] Liber de exhortatione castitatis. Migne, *Pat. Lat.* **2**: 921. "Ut opinor autem, unius et ejusdem Dei utraque pronuntiatio et dispositio est: qui tum quidem in primordio sementem generis emisit, indultis conjugiorum habendis, donec mundus repleretur, donec novae disciplinae materia proficeret; nunc vero sub extremitatibus temporum compresset quod emiserat et revocavit quod indulserat, non sine ratione prorogationis in primordio, et pastinationis in ultimo. Semper initia laxantur, fines contrahuntur. Propterea sylvam quis instituit et crescere sinit, ut tempore suo caedat. Sylva erit vetus dispositio, etc."

[20] *Pat. Lat.* **23**: 275–282. Long solid columns reappear in a treatise later attributed to Hugh of St. Victor. *Pat. Lat.* **176**: 1203.

[21] Augustine in *Pat. Lat.* **34**: 398. Commentary on Genesis 9: 7. "Hoc (bonum matrimonium) autem ait, tripartitum est: fides, proles, sacramentum. In fide attenditur ne praeter vinculum conjugale, cum altera et altero concumbatur: in prole, ut amater suscipiatur, benigne nutriatur, religiose educatur; in sacramento autem, ut conjugium non separetur, et dimissus aut dimissa nec causa prolis alteri conjungatur. Hac est tanquam regula nuptiarum, qua vel naturae decoratur fecunditas vel incontinentiae regitur pravitas."

[22] Compare, for instance, St. Bernard in the twelfth century. *Pat. Lat.* **183**: 897 (*1348) and 492. "Inter splendorem solis et caliginem soli hujus, non parva distancia est."

[23] Strong, E., Terra Mater or Italia? *JRS* **27**: 114–126, 1937.

[24] The quotation is from *De inani glora*, 70 and is quoted by Laistner, M. L. W., Pagan schools and Christian teachers, *Liber floridus*. Festschrift Paul Lehmann, 58, St. Ottilien, Eos Verlag, 1950.

The early marriage of children in order to provide a succession in the family is, of course, a very dangerous demographic attitude in any society where there is chance of overpopulation; this was not true of the time of Chrysostom when it seems to have been declining.

By the early eighth century when Bede discussed the text, "Increase and multiply," there was an acceptance that the Second Coming might not be immediate: at least Bede mentions it casually in a reference to the filling of the earth. Marriage was an honorable estate when it was created for the purpose of procreation, although chastity was the more honorable. There is not even mention that it was created partly to prevent sin. Indeed it seems to have been created at least partly for the glory of God who in the person of Christ was to assume human flesh.[25]

Even in the twelfth century the ideas remained much the same. A gloss (the Ordinary?) quotes Bede almost verbatim.[26] The rather depressing opinion of woman continues in Guibert de Nogent, in many ways one of the outstanding intellects of that century.[27]

> Eve, however, that rebellious and untamed animal never acquiesced voluntarily to the wish of the spirit, but always resisted the hard things with the eagerness of virtue. Eve is our flesh who at the suggestion of the devil bent away from reason and turned dishonestly to the direction of appetite. Adam indeed as the Apostle said was not seduced but Eve was, whence she seduced man.

The problem of tracing theory is largely that of finding comments upon passages in the Bible which seem to encourage[28] or discourage[29] increase in population. However, in the twelfth century Peter Lombard produced his *Sentences* which became a standard text in theology and which was the subject of a very considerable number of commentaries. He has a number of passages which invite demographic theorizing, among which is the following:[30]

> The institution of marriage is double. Before the fall it was first an office in Paradise where the thorus was immaculate and nuptials honorable, from which they conceived without passion and bore children without pain. After the fall outside of Paradise marriage was given as a remedy against illicit action. The first marriage was granted that nature might multiply: the second that nature might be restrained and vice prevented. For before the fall God said, "Increase and multiply" and even after the fall when all men were consumed by the flood. Thus marriage was instituted first as an office and afterward it was conceded as a remedy.

With the thirteenth century the concentration upon marriage as a means of producing children and preventing sin tended to lessen sufficiently to admit other factors. William of Auxerre, for instance, although saying that the above were the necessary causes, goes on to say that there were some useful final causes such as extension of charity, reconciliation of enemies, and pacification of kingdoms.[31] Somewhat the same line is followed by Hugh of St. Cher. The two principal reasons were given as usual. Then he adds that there are many secondary purposes such as reformation of peace, the union of persons (presumably for political reasons), and the beauty of woman.[32]

About the middle of the thirteenth century Aristotle's *Ethics* began to exert its influence upon scholastic thinking. Peter of Tarantaise brought the philosopher's ideas into a discussion of marriage, saying that in *Ethics* VIII he emphasizes the education of children and the mutual character of marriage.[33] However, the child

[25] *Pat. Lat.* **91**: 31. "Crescite et multiplicamini et replete terram et subjicite eam. Hec etiam multiplicatio hominum et repletio terre non nisi per conjunctionem erat maris et femine perficienda. Si autem benedictione Dei crescit ac multiplicatur genus humanum; quanta sunt maledictione digni, qui prohibent nubere, et dispositionem celestis decreti quasi a diabolo repertam condemnant? Non ergo damnande sunt nuptie, quas ad propagationem generis humani, terramque replendam, superne gratia benedictionis instituit; sed magis honoranda, maiore est digna benedictione virginitatis, que postquam repleta est terra hominibus, casta mente simul et corpore Agnum, etc."

[26] Paris, B. N. *MS lat. 63,* fo. 8r. *"Crescite et multiplicamini.* Multiplicatio enim hominum coniunctione et maris et femine perficitur. Non igitur dampnande nuptie quas ad propagationem superna benedictio instituit etsi virginitas preferatur."

[27] Guibert de Nogent, *Moralium in Genesin,* I, 27–28. *Pat. Lat* **156**: 57. "Eva, tamen, rebelle et indomitum animal, nunquam voluntati spiritus voluntarie acquiescit, sed semper virtutis studio dura resistit. Eva autem est caro nostra, que suggerente diabolo lenocinatur rationi, et inflectit ad consensum appetitus inhonesti. Adam, enim, ut ait Apostolus, seductus non est, sed Eva, unde et virum seduxit" (1 Tim. 11: 14).

[28] See list: Stangeland, C. E., *Pre-Malthusian doctrines of population,* 54, New York, 1904: Gen. 28: 14; Deut. 26: 5; Proverbs 14: 28; 17: 6; Psa. 127: 3–5; Eccles. 4: 8; Jer. 22: 30.

[29] Stangeland, *op. cit.,* 58–59: 1 Cor. 7; Romans 9: 13; Coloss. 3: 5; 1 Thess. 4: 3; 1 Tim. 5: 11–14; Matt. 19: 12; 1 Peter 2: 11.

[30] Peter Lombard, IV, 26(2). Others are IV, 26: 30(4); 31(4, 5). *Pat. Lat.* **192**: 918. "Conjugii autem institutio duplex est. Una ante peccatum ad officium facta est in Paradiso ubi est thorus immaculatus, et nuptiae honorabilis ex quibus sine ardore conciperent, sine dolore parerent; altera post peccatum ad remedium facta extra Paradisum, propter illicitum motum devitandum. Prima ut natura multiplicaretur; secunda ut natura exciperetur et vitium cohiberetur. Nam ante Peccatum dixit Deus, Gen. i. Crescite et multiplicamini et post Peccatum omnibus pene hominibus per diluvium consumptis. Quod vero ante peccatum institutum fuerit conjugium ad officium, post peccatum vero ad remedium concessum."

[31] Paris, B. N. *MS lat 3,057,* fo. 274rv. (Summa magistri Guillelmi Altissiodorensis.) "Secundo capitulo dicitur de causis matrimonii quarum quedam sunt finales, quedam materiales, quedam formales, quedam efficientes finalium. Quedam sunt necessarie, quedam utiles. Necessarie sunt quedam procreatio et fornicationis vitatio. Secundum prolis procreationem, dicitur matrimonium institutum ad officium. Secundum fornicationis evitationem dicitur institutum ad remedium. Cause finales utiles sunt caritatis dilatacio, inimicorum reconciliatio, bellorum sedacio, regnorum pacificatio—."

[32] Paris, B. N. *MS lat 3,073,* fo. 5r, col. 2. (Questiones super Sententias.) "Duo sunt cause principales scilicet fornicationis vitatio et sobolis susceptio. Multe sunt secundarie ut pacis reformatio, personarum coniunctio, mulieris pulchritudo—."

[33] Paris, B. N. *MS lat 3,054,* fo. 97v. (Summa of Peter of Tarantaise.) "Unde tria habemus a parentibus secundum

rather than the wife remains in the forefront. The idea of Aristotle occurs also in Nicholas of Lyra without attribution and rather inconspicuously.[34] Man and wife are joined in all things, not only for the generation of children as other animals, but even for the home in which some duties are proper for the man and some for the woman. Nor does he fail to add that man is head of the family and of the woman because she was formed from him. This change falls in line with the development of secularism in the later Middle Ages.

The implication of this clerical theory was, of course, that there should be no interference with normal processes of sexual intercourse, with pregnancy, or with the child itself after birth. The child, indeed, was naturally, since it might be male, of more importance than the mother. The manuals of confession thus stress that interference by incantation, by poison, or by violent exercise to produce abortion was murder.[35] Naturally, permitting the child to die at birth was also murder. The ecclesiastical theory upon this was thus very distinct and certain, and the penalties for violation involved very severe penance.

In view of the long distrust of women by the clergy, it is no little surprise to find that marriage became one of the seven sacraments. The other sacraments were considered to "avail unto salvation," directly by participation in them. It is only natural that the scholars of the thirteenth century debated seriously the problem of marriage as a sacrament.[36] It was, of course, to beget children and to prevent sin, both centred upon the sexual act, which certainly no clerical scholar would suggest as a religious act or one leading to salvation. It was symbolical of the union of Christ and the Church, but according such an act an augment of grace certainly moved in the direction of the fertility cults from which the Church was, in part, a revulsion.

The great weight of the influence of St. Thomas Aquinas was in favor of population increase because it would bring political power.[37] Nevertheless, he believed that prolificity was a general good rather than a universal one and that celibacy had its place. Giles Colonna believed in children as the perfection of the family.[38] It is not surprising that the secular writers of the end of the Middle Ages also believed in population increase for political purposes. Machiavelli and Botero were both in favor of such in Italy at that time.[39]

The period of leveling off of the population with the approach to limits of subsistence as indicated by the awful famine of the years 1315–1317 would naturally tend to suggest that something should be done about overpopulation. Such a statement does appear but it is addressed to Charles V of France just after the Black Death which would seem to make such foresight unnecessary.[40] The practical application of such foresight would seem to be apparent in spite of clerical pressure until the end of the Middle Ages in the superior sex ratio of the time.

Clerical theory then may be claimed to favor either prolificity or celibacy or even restraint within marriage. The last named was hardly a possible development upon a large scale. The celibate numbered only a tiny fraction of the population. Since the great mass of the people were told that prolificity was proper and since also they were given by the Church no objective which would limit population, it can hardly be denied that the ecclesiastical policies favored increasing population. The matter may well be studied more carefully, especially for reasons why population began to increase faster than subsistence about the Mediterranean at the end of the fifteenth century in Italy.

4. TECHNOLOGY AND INVENTION

Population in the late ancient and medieval period tended to be related to positions providing subsistence, as has been seen. This would imply a keen interest in developments which might affect employment, among which would be the use and invention of machines. Two theories have usually appeared in regard to machines. The more primitive and more general is that they are substitutes for men and thus cause unemployment. The second is that they relieve man from manual labor releasing him for other interests which in turn provide employment elsewhere. That there was much invention even of labor-saving devices is evident especially for the later Middle Ages. Indeed,

Philosophum libro Eth. scilicet esse, matrimonium et disciplina. Filius autem a parentibus educati et institutio instrueri proset nisi aliquos et determinatos et certos parentes haberet quod non fieret nisi esset obligatio viri ad mulierem determinatam que obligatio matrimonium facit. Secundo etiam quem ad finem secundarium, scilicet, quin est mutua societas et obsequium in rebus domesticis sicut eius natura rationalis inclinat ad communem vitam, quia unus homo indiget opera alterius sic inclinat ad associationem quodam viri ad mulierem, quia inter opera quibus indigetur quedam pertinet magis ad virum, quedam ad mulierem. Has duas causas matrimonii ponit Phs viii Eth."

[34] Paris, B. N. *MS lat 364*, fo. 4r, col. 1. (Postilla fratris Nicholai de Lira.) "Tertio quia masculus et femina coniunguntur in omnibus non solum propter generationem et in aliis animalibus sed etiam propter domesticam vitam in qua sunt aliqua propria opera viri et aliqua femine. In qua vir est caput mulieris propter quod convenienter ex viro formata sicut ex suo principio."

[35] For instance, see quotations from Thomas of Chobham in Russell, *BMP*, 159–161.

[36] For a study of this argument: Lynch, K. F., The theory of Alexander of Hales on the efficacy of the sacrament of matrimony, *Franciscan studies* 11: [69]–[130], 1951.

[37] "Quae familia plus multiplicatur in prolem, amplius cedit ad firmamentum politiae." *De regimine principum*, IV, iv, quoted by Gonnard, R., *Histoire des doctrines économiques*, 41, Paris, 1943.

[38] *Ibid.*, 41.

[39] Reynaud, P., *La théorie de la population en Italie du XVIe au XVIIIe siècle*, 17–30, Paris, 1904.

[40] "Posset et esse tanta multitudo, quod si ulterius exerceret, terra non esset sufficiens ministrare cibum hominibus" by an anonymous writer quoted by Gonnard, *op. cit.*, 41.

it has been suggested that this technological development was one of the glories of the period.[41]

There seems to have been no objection to agricultural inventions which simply enabled fewer people to till the land. Several occurred just as the Carolingian Empire was declining and probably contributed to the great rise in population from then until 1348. The heavy plow may have been introduced very early in the Middle Ages but seems to have been used widely only in the middle period.[42] Certain new crops, notably oats and rye, came in with the German migrations and were particularly valuable in the areas which were too cold to grow wheat easily. In the eighth or ninth century three inventions appeared which were to stimulate agriculture: the rigid horse collar, tandem harness, and the horseshoe.[43] The combination of these inventions set up the horse as a competitor to the ox and with the three field system enabled the farmers to produce a great deal more grain.

Nor was there objection to inventions which would not affect employment or merely transfer effort from animals to machines. A good illustration of the latter is the mill, water or wind, which became common in the early and later Middle Ages respectively. The wheelbarrow probably falls in somewhat the same class although in most cases it probably enabled one man to do what two men did. The eyeglass was an obvious aid and probably stimulated the book trade. Military inventions proceeded since they seemed to have no effect on employment. Most of these inventions should have had little effect upon population. The increasing size of ships in the later Middle Ages did tend to encourage the cities upon larger and deeper ports, while the development of cheaper methods of road building opened up possibilities of all-year transportation in clay areas where roads had been largely impassable in rainy seasons.[44]

On the other hand the objection to machines existed. Vespasian is alleged to have refused to see a hoisting machine, saying, "I must feed my poor."[45] It is likely that the anti-technological attitude of the great medieval gilds affected population negatively by preventing the development of an industrial revolution in the thirteenth–fourteenth centuries with all of its demographic consequences. Certainly the inventors of those centuries could have produced the rather simple textile machinery which is usually said to have caused the eighteenth-century Industrial Revolution. The problem then is to find why society prevented the use of machinery in the great businesses in the Middle Ages and permits their use in modern times.

The demographic theories generally favored rigid control of population and favored a relatively low number of people. Even the Roman imperial effort was essentially defensive and aimed to stabilize rather than increase population. The clerical theory rather implied lack of control but it apparently was not popularized and made relatively little impression. The common lay theory certainly stressed the limitation of population to what could be cared for and the antagonism to industrial machines prevented the development of an industrial revolution although the improvement in farming stimulated great growth. There still remain problems to consider even in the developments mentioned above.

Furthermore, a great area which has hardly been touched is the determination of the social attitude toward settlement of land. Great areas were withheld from settlement to provide hunting areas for the ruling class in the later Middle Ages and probably in the earlier as well. Was the same thing done to keep land for grazing of flocks? The forces which controlled population still need a careful study.

XII. POPULATION AS A FACTOR IN LATE ANCIENT AND MEDIEVAL HISTORY

To what extent do population and its changes influence the course of history in the late ancient and medieval periods? It is reasonable to expect at least an attempt to answer this question at the end of a study of conditions of population. Any answer at this stage of the study of population history must be exceedingly tentative because so little has been done upon the effect of population in history. As mentioned earlier the tendency has been to disregard it as a possible influence, considering it merely as part of the frame of reference of historical developments of a more dynamic character. Yet, one might hazard the opinion that demographic conditions would have their influence as certainly as the geographic conditions, and few deny the influence of the latter.

Already, however, evidence is appearing which would show that population is not merely an inert result of economic or social conditions but that it is a force in itself. Increasing population may well have a definite effect upon society, creating a driving force which lends itself to imperialism and to interference in the affairs of others. *Lebensraum* is an ugly term which was often used by Hitler's Germany to excuse expansion of its increasing population at the expense of neighbors to east and west and to demand that colonies be granted that country. Similar terms were used by Mussolini and the Japanese imperialists. Because the French population was not increasing the authorities decided

[41] White, Lynn, Jr., Technology and invention in the Middle Ages, *Speculum* **15**: 141–159, 1940. Also Bouthol, G., Population et progrès technique, *Rev. intern. de sociologie* **43**: 185–197, 1938 and scattered information in Sarton, G., *Introduction to the history of science.*

[42] White, *op. cit.*, 144, 151.

[43] White, *op. cit.*, 151.

[44] Sion, J., Quelques problèmes de transports—, *Annales d'hist. écon. et sociale* **7**: 628–633, 1935.

[45] Suetonius, *Vespasian*, XVIII, 2; Frank, *ESAR* **5**: 6, 54.

that in the future they should follow a defensive policy rather than an offensive one. Shifts in age have been shown to have definite connotations in commerce: an aging population is interested more in pensions and less in schools, while the great increase in the number of children of the last decade has created distinct problems in the school situation. These obvious influences of demographic changes raise the question whether population may not always have been an important factor in the history of the world.

The era of the late ancient and medieval world offers peculiarly interesting opportunities for studying the influence of population. It includes the longest and most consistent period of population decline of historical times and thus presents evidence about the influence of this type of population change. The two apparently shorter declines of Germany and Spain at the end of the Middle Ages are also available for comparison. The much commoner condition of rising population also occurs, as we have seen, enabling one to compare the results of rising with those of declining population in the period. Furthermore, the actual numbers in the several areas shift very markedly from one period to another, presenting a wide variety of demographic conditions, with varying historical impacts of one area upon another. On the contrary the proportion by age and sex, such as the rather limited evidence shows, seems remarkedly static. There were exceptions of which the times of plague were the most obvious. The low age average and high sex ratio have certain rather obvious implications, but they are occasionally offset by conditions produced by the shift in population numbers.

The effects of population change naturally depend upon the character of the cause. Population changes are comparatively slow. They offer nothing as sudden and spectacular as a Mongolian foray, much less a decisive battle. Even the awful years of plague reduced the population by a fourth, at most, in 1348–1350 and many of the victims were from the aged and thus less significant part of the peoples. The demographic changes were widespread and slow and the results of the changes would probably be of the same character, changes in relative strength of military and political power over the decades and centuries. These would be potentials in the situation which might or might not be used by leaders of the groups. Many illustrations of the potential will be presented below. The second type of result is a change in attitude and interest of a population. The latter is more difficult to define and isolate, but a change in attitude or interest should have definite characteristics and expressions.

There is an approach to the spirit of an age if one assumes that this spirit is expressed in the attitudes and institutions of the time. An age will demand loyalty to the ideas which it deems most important and will be intolerant toward those who refuse to conform. It will honor and regard as almost superhuman those who embody the ideals of the age. It will develop those institutions which tend to express its ideals in practice. Today, for instance, our age insists upon loyalty to country and punishes treason, honors the statesman, and concentrates power in the government. It is therefore a politically-minded age. We might expect an economically-minded age to hold one economic doctrine and execute those who hold others, to deify business leaders and concentrate all power in business institutions. Or a religiously-minded age might demand that there be only one religion which all must join or suffer death, while the saint would be honored and the Church take a dominant place. By examining such developments, we hope to come to some conclusions about the spirit of the medieval period.

Little space will be given to two types of results from demographic causes, although probably more should eventually be devoted to them: demographic theory and economic results. The predominant demographic theory, as we have seen, was that population should be kept under control, usually by restricting marriages to those who had means to support a family. The effect of this theory was to limit total population within means of subsistence at practically all times. Elsewhere reference is made to the problem of relating prices and wages to the movement of population. It would seem to be promising but nevertheless somewhat complicated; the other factors touching prices and wages are many. There is a distinct danger that one might be influenced by the course of wages and prices into certain interpretations of the evidence. An illustration is the statement that population increases with number of holdings and greater marginal utility.

Logically the increase of holdings would increase the number of families. The improvement of agriculture notably in the ninth–tenth centuries would make it possible to keep a family on a smaller holding: perhaps 30 acres instead of 60. Even the price of grain would be a factor in regard to the possibility of marginal holdings. It has been noticed, for instance, that in sixteenth-century England, at one place at least, marriages increased with the price of grain.[1] Thus population would tend, if this was a general practice, to increase in times of high grain prices and might remain static or decline in times of poor prices. If population is counted in terms of holdings the increase might be immediate. The extra marriages would presumably be on marginal lands which only in times of high prices would support the family. This would, after a few years' lag, create greater demand and therefore higher prices.

1. DECLINING POPULATION

The problem of the influence of declining population is considered first because its influence should be dissimilar from the influence of our rising population today

[1] Morrell, C. C., Tudor marriages and infantile mortality, *Jour. State Med.* **43**: 175, 1935.

and therefore easier to isolate. The longest period was from about A.D. 200 to 600. The decline may have actually commenced some decades earlier but probably ended near the turn of the sixth century. The area included the Mediterranean (except for Asia Minor and adjacent Balkan territory) with Gaul and the British Isles. It was then a very large area for a considerable period. Two other instances were Germany and Spain from the Black Death into the sixteenth century, although some may question the decline in Spain. The problem is to relate the decline to other conditions which accompanied it and may have been caused by it. The answer is in the nature of an hypothesis about the relationship. In general we suggest that depopulation brought depression, economically, socially, and intellectually, and that these induced a stronger religious interest.

Depopulation would tend to decrease speculative values in rents and property and thus tend to make it more and more difficult for the civic class upon which the Roman Empire depended to such a large extent. The position of this class was made difficult by imperial insistence that sons should take over the tax burdens of their fathers in the declining cities, burdens which were not lightened fast enough. To the financial burdens, hard as they were, the empire added the burden of boredom as it abolished or curtailed the exciting civic life of elections and self-government. The repression of "dangerous" religious and political ideas, as illustrated by the hard conditions laid upon the Christians, made life even harder and less interesting. A kind of slave society was forged into which a family might well hesitate to bring more children. Many felt and said that the world was growing old [2] and others fled from the empire.[3]

At the same time increased interest in religion appeared, particularly in those religions which promised a future life to compensate for the ills of this life. There were a number of these in the empire. However, society nearly always demands conformity in the areas of thought which it considers most important. It is then not surprising that the field of religions narrowed down rapidly to Mithraism and Christianity and then finally Christianity won out and became intolerant of others. Its intolerance was carried further until a relatively narrow range of ideas was deemed necessary for strict orthodoxy and those who held other ideas were punished even by death. Other evidences of the dominance of religion as the major interest appear in the acceptance of the saint as the hero of the age and of the heretic as the worst enemy of mankind. The consolidation of religious feeling in the institution of the Church is other evidence of the development.

Furthermore, many phases of life and even of other religions were swept into the great Christian stream to persist in interesting form. The chief feast of Mithraism became Christmas. The mystery religions contributed ideas and practices in regard to Easter, vestments, candles, and services. The Church took over ideas of Roman organizations: cities as jurisdictional units, provinces, dioceses, and even a formal headship of Rome itself. Stoicism appears in the sermons of Ambrose: the citizen must not shirk his civic responsibilities. Local deities became local saints and local religious practices were incorporated in Christian experience. Sometimes secular opinion triumphed over clerical ideas as the Christians insisted more and more upon the celibacy of a reluctant clergy, another illustration of the attraction of vicarious virtue to all ages.

The increased interest in religion was accompanied by a loss of interest in other phases of life, indicated by decline or simplification of activities in those fields. The most important phase of this was the decline in government as a factor in the west, since it did not touch the eastern half of the empire to any extent. Thus, not only did the Roman Empire of the west break up in the fifth century but its successors, the Germanic kingdoms, never succeeded in producing as strong governments and eventually disappeared. The lack of real political interest is manifest well into the central part of the Middle Ages in the weakness and lack of general appeal of feudalism. The same decline is evident in the economic life of the period. One might attempt to show the same in regard to intellectual life except that the writings of the Christian leaders were probably as profound if not as polished as those of their pagan predecessors and certainly surpassed them in volume.

The great decline in fourteenth-century population failed to produce a notable religious revival although there were temporary manifestations of odd character. Probably the drop in population was too sudden to bring a serious depression. The money in circulation was divided immediately among the surviving people, leaving the average higher than it had been before.[4] Wages actually rose for a time. The bottom of population numbers was reached before real depression set in. However, for Germany and Spain depression continued and apparently produced a manifestation similar

[2] Sanford, E. M., Contrasting views of the Roman Empire, *Amer. Jour. Philol.* **58**: 454–455, 1937; "Mundus senescit," Pseudo-Fredegerius, M. G. H. SS. Rer. Merov. II, 123; Malcolm, D. A., Urbs Aeterna, *Univ. of Birmingham Hist. Jour.* **3**: 1–15, 1951: O. Seeck thought that depopulation was an important factor in Rome's decline (*Geschichte des Untergangs der antiken Welt,* Berlin, 1910). For other theories see Baynes, N. H., The decline of Rome in western Europe. Some modern explanations, *JRS* **33**: 29–35, 1943.

[3] Secretan, H.-F., *La population et les mœurs,* 11–117, Paris, 1916, esp. pp. 55–56. For a fine description of the problem caused by declining manpower and greater political and economic burdens see Boak, A. E. R., *Manpower shortage and the fall of the Roman Empire in the west,* Ann Arbor, Univ. of Michigan Press, 1955.

[4] A good illustration of this is given by Prat, G., Albi et la peste noire, *Ann. du Midi* **64**: 18–25, 1952.

to those of the late ancient period. The Lutheran movement was preceded by other developments denoting religious interest and was based upon deep emotions held by very large groups of people. It is probable that the same depth of emotion was responsible for the religious developments of sixteenth-century Spain.

The setting up of an hypothesis that depopulation and resultant depression may be expected to encourage religion suggests a monistic approach which is not very favorably received by historians. Yet it may well be that in the reaction from deterministic explanations, one may lose sight of the probability that among many causes great differences in effect exist and that one must be of more importance than the others. In this case another approach to the hypothesis is to examine the possibilities of influence of rising population to see whether its effects are the opposite of those assigned to declining population.

2. RISING POPULATION

Rising population was also characteristic of the medieval period. The rising temperature of the early period tended to encourage increase of population in central and northeast Europe, possibly also in the Balkans and Asia Minor until A.D. 542. Following the Black Death of 542–600 population probably increased nearly everywhere until after A.D. 800. From 1000 to 1348 there was a phenomenal increase in northern Europe and even in Italy and Spain. Finally at the very end of that period the upward trend appeared in Italy, France, and possibly other states. As mentioned earlier, expansion is normal and its results may be easily missed by those who are accustomed to that form of development. In general, we should expect the result to be opposite of that produced by an era of depression.

As might be expected, population advance within limits of subsistence was accompanied by prosperity. Such increase naturally improves speculative values and creates the sense of growth, vitality, and strength. It certainly improved morale, whether it was in fourth-century Germany, tenth-century Germany, seventh-century Islam, tenth-century Byzantium, or western Europe in the twelfth–thirteenth centuries. The limit of subsistence was, however, probably being reached by fourteenth-century northern Europe as the population tended to level off then. It may have been reached earlier by the semi-nomadic areas as the amount of moisture declined.

The low point of the general decline in the west was reached probably at the end of the sixth century. It has been noticed that this century saw a change in cultural conditions which continued into the rest of the Middle Ages.[5] It involved a change of attitude which was discernible at the time even though the state of affairs remained poor for a long period after it. In western Europe the increase is probably behind the development of the Carolingian Empire in which the Pepins and Charleses capitalized upon the energy and morale of an increasing population. It then continued in Germany, Scandinavia, and even in Russia, producing under able leadership startling political developments. The increase in military and political strength was accompanied by commercial advance and in several places by brilliant intellectual revivals. Among these were the Carolingian and Byzantine on the Christian side and the revivals at Bagdad and Córdoba on the Mohammedan. Though they were largely limited to passing on the classical tradition, they even made modest contributions of their own.

These instances of strong governments based upon increasing and usually large population illustrate distinctly secular tendencies, as mentioned above. However, there seems no decline in religious interest. Indeed, the political leaders assumed that a strong religious life strengthened their political leadership and devoted themselves to building up the Church. There was no conscious feeling of antagonism between the state and the religious groups. This may represent the continuing momentum of the age of depopulation into the age of increase, the kind of momentum which nearly always appears as an element of continuity in a new age. The ideas of Caesaro-papism were very common and raised the ruler very near to the position of a priest or bishop with respect to leadership in religion, while the confusion was increased by the acceptance of temporal responsibilities of cities by bishops. It took the great theological controversies of the late eleventh and early twelfth centuries to define the differences between the church and state.

This theological controversy which did so much to separate the ecclesiastical and lay interests saw the beginning of the most rapid and prolonged advance of population of the medieval period. It was ended only by the Black Death of 1348. The area of increase included most of the European world but was apparently less in the Balkans and in Spain than elsewhere and hardly affected the Mohammedan world. The political side was probably the most spectacular part with the rise of the Italian and other city states and the consolidation of political power in the hands of national kings. The movement in the direction of modern nationalities continued with little loss after the era of plague into modern times. With this political advance there went also an almost equally important economic advance. It can hardly be disallowed that these developments were largely secular in outlook.

The secular attitude appears in a desire for more concrete and tangible ideas.[6] It is not surprising that marked advances in technology occurred also, partic-

[5] Genicot, L., Aux origins de la civilization occidentale, Nord et Sud de la Gaule, *Miscellanea historica in honorem Leonis van der Essen* 1: 81–93, Brussels, 1947; Levison, W., *England and the continent in the eighth century*, 2–3, Oxford, Clarendon, 1946 and Doehaerd, R., *L'Expansion économique belge au moyen âge*, Brussels, La Renaissance du Livre, 1946.

[6] White, Lynn, Jr., Technology and invention in the Middle Ages, *Speculum* **15**: 141–159, 1940; Natural science and natural-

ularly at the end of the thirteenth century. Learning spread widely as new opportunities arose for clerks to handle the extensive documentation, while the many new religious houses set up by prosperous lords of the time opened opportunities for thousands more. Even the new mendicant orders illustrated the secular tendencies as they drew much closer to the mass of the people than had the older orders. A new attitude toward woman appeared, sublimated in the adoration of the Virgin. A new respect appears in literature: Beatrice leads Dante through Heaven. The saints would have been shocked at this.

The attitudes toward religion are interesting. At first the Church organized itself solidly and became a mighty power, so much so that Innocent III (1199–1216) was almost an arbiter among the sovereigns of Europe. The new wealth was poured into monasteries to house the new orders which represent the religious momentum of the twelfth–thirteenth centuries. Similarly church building proceeded on a magnificent scale even into the fourteenth century. Thus the impetus of the rising population seemed to have expressed itself within the Church, much as it had done in the seventh–ninth centuries. Even in the later Middle Ages literacy seems to have spread widely and the life of the parish churches seems never to have been healthier. The appearance of heresies also indicates the wide religious interests of the time.

If the power of the Church was at a high in 1200, by the time of the Black Death it had been reduced by the new national states. Few fourteenth-century kings followed the admonitions of the popes, so changed were the positions. More and more the kings tightened their control over the appointment of bishops and of other ecclesiastical leaders. Furthermore, the monasteries suffered a loss of religious interest which aroused criticism throughout Europe and led eventually to their suppression in many places. Very few persons were canonized in the later Middle Ages. While, in general, the position of the Church was solid and substantial, it now had a position as a corporation with legal rights and had a conventional regard from masses of the people. Obviously political interest had increased beyond the religious interest in the period.

Thus far the discussion has been about the influence of a rise in population within limits of subsistence. Population practices largely prevented rise beyond limits of subsistence except in the early fourteenth century. Here probably it was a case where subsistence was lowered by the worsening climate and more particularly by the great famine of 1315–1317.[7] There was no long continued era of rise against subsistence since famine conditions were relieved and population was reaching a ceiling in the first half of the fourteenth century. It has been suggested that even then the diseases and the plague itself may have been aggravated by the famine.[8] The results of rise under such conditions are revealed by the recent demographic conditions of India and China which, fortunately for them, the Middle Ages did not have to suffer severely very often, although there were many instances of famine.

In general such times of increasing prosperity caused developments occurring at the same time to be favorably received because of their association with good times. People were "conditioned" to believe in the value of these developments. The English Parliament grew in stature and popularity in the very prosperous thirteenth century whereas the French Estates General's only era of power was amid the chaos and confusion of the fourteenth century. The effects of conditioning reinforce the ideas already presented about the results of rising and falling population within limits of subsistence. The former tend to produce economic prosperity and interest in this world while the latter induces depression and in turn deepening interest in religion. By introducing a dominant feeling the whole course of history was changed.

3. DIFFERENCES IN POPULATION CHANGE

In the medieval world, as in the modern, population was one factor in political power and in the constant struggle which went on then. As a potential it was always important although probably less so than today. In general armies were very small and were composed largely of the ruling, fighting class. The scope for such factors as leadership, weapons, and morale was much greater as a result. Population effect was probably most apparent when changes in numbers occurred in two areas which were constantly hostile. Here it was sometimes the determining factor since the other factors remained relatively constant. Less studied but of some importance was the influence of emigrants sent out by lack of opportunity or land in countries becoming heavily populated. The expansion of the Northmen is probably the most outstanding of such developments.

Of the first type of influence, the demographic changes of the later empire in the west and in the adjacent barbarian territories are important. The Roman population declined steadily while the extra-frontier areas seem to have increased steadily, if not rapidly. Yet in the fourth century the population of the western half of the empire must have been several times that of the German tribes outside. Still the tribes managed to break through and within a short time reduced the west to their rule. Their history, as is well known, is a very complicated one. Population decline, as noticed above, may well have broken down the morale of the area as well as reduced the soldier

istic art in the Middle Ages, *Amer. Hist. Rev.* **52**: 421–434, 1947.

[7] Lucas, H. S., The great European famine of 1315, 1316, and 1317, *Speculum* **5**: 343–377, 1930.

[8] Wolff, P., IX Hist. Congress **1**: 74–75 (*Rapports*), Paris, Armand Colin.

potential of the west. The problem was of potential soldiery rather than of total number in the population.

In the eastern half of the empire there was evidently some population decline in Egypt and about the Aegean, but the critical areas of central Asia Minor and the Balkans seem to have experienced an actual increase. These were the great reservoirs of manpower upon which the Byzantine Empire depended for its armies. The greatness of that empire, which is increasingly appreciated for its share in handing on classical culture, enjoyed a powerful capital in Constantinople, naval centres in the Aegean, social mobility which permitted even peasant families to rise to the imperial purple, a splendid diplomatic tradition, and respect for intelligence. Nevertheless, the loss of central Asia Minor in 1071 to the Seljuk Turks was a deadly blow to the empire. Earlier it lost its southern possessions to the Mohammedans who seem to have profited by what was almost a demographic freak.

Recent medical research has shown that dry warm areas seldom suffer much from bubonic plague. Thus probably from 542 to 600 the semi-nomadic areas of North Africa, Arabia, and Persia did not suffer the heavy loss which the settled areas did. This, in itself, gave the semi-nomads the potential strength to make much more difficulty for their neighbors. Perhaps, if Mohammed had not appeared, the desert dwellers would merely have extended their depredations and perhaps attained a wider control from the deserts. And in the succeeding reaction they would probably have been dislodged again by the Byzantine Empire. Mohammed, however, appeared with a religion and government surprisingly well suited to the semi-nomadic world. The potential was converted into an actual system which still is a great force in the world.

Now the great advance made by the Mohammedans seems to have been slowed by reaching the demographic limits of the semi-nomadic world about A.D. 800. At the same time the increase in population with the recovery of the Byzantine Empire raised the strength of the latter until it held off the Mohammedans. Here the move of the capital to Bagdad, the loss of Spain and practical loss of Maghreb (North Africa) shifted the weight of Mohammedan population away from Constantinople and from the Mediterranean. After all its demographic center was Mesopotamia to which the capital naturally gravitated. Yet had it stayed at Damascus or been moved to Antioch or Alexandria, it would have constituted a much more serious danger to Byzantium.

Beginning with the tenth century a marked population differential appeared between the southeast (Mohammedan and Byzantine) and the west, both Mediterranean and central and northern Europe. Its characteristic result was the Crusades. After all a very considerable population superiority was required to make those expeditions even ephemeral triumphs. The eastern areas had the advantage of greater wealth, fortified cities and acclimatization of their people. Along with the armies and probably more influential were the merchant fleets of Venice, Genoa, and Pisa of Italy and of Marseilles and Barcelona of France and Spain.

In the period of great decline the case of France is a good illustration of a potential that was not translated into military power. Its population grew until it was the most densely populated large area that western Europe had seen. One might have anticipated that it would have expanded at the end of the thirteenth century into the badly divided neighboring territories of Italy and Spain. Philip IV seemed the ideal character to lead such forays. If his expedition which captured the Pope temporarily be excluded nothing appeared along lines of territorial expansion. Furthermore, France found herself invaded in the fourteenth century by England which had grown at about the same rate as France but was still only about a third of her size. The thirteenth century was none the less a French century in western Europe. Its language carried great prestige and its feudal society was the envy of its neighbors. Its potential was apparently realized outside of the military sphere.

Thus the effects of differential population change would seem to be the rather conventional ones characteristic of every period of history. Even the small demographic influence of medieval warfare as compared with modern, the result of the small size of armies, is typical of the times before the Industrial Revolution.

4. AGE AND SEX GROUPING

In contrast to the fluctuating numbers of persons in various parts of the areas under study, the stability of the age and sex structure of the population is remarkable. About half of the population was under the age of twenty, although there was apparently a lengthening of life in the thirteenth century. The span of life (possible length of life) was about 100 years but relatively few reached it although rather more than might be expected passed into old age. There tended to be more men than women, often many more men than women. This social structure has some rather obvious implications in its low age average and high sex ratio.

The age composition placed a third of the population below the age of fourteen or fifteen and thus in the position of a large non-productive burden upon the others. The care of the children was accomplished furthermore with little help from machinery, so that a very high per cent of human effort went into the caring of the family and bringing up the children. The high death rate, apparently due to tuberculosis, placed a further heavy burden upon society since these young people required all the effort of rearing and died just as they began to contribute to the work of society. On the other hand the few who survived naturally enjoyed exaggerated respect if they possessed wisdom and, par-

ticularly at the end of the period, incurred fear as possessed of demoniacal qualities if they were peculiar.

In these circumstances, democracy, which seems to require much education and abundant free time for participation, was probably impossible upon a country-wide basis. In the cities, medieval and even late ancient democracy was often excitingly successful, but participation was usually limited to the wealthier people. The high level of civic life was probably somewhat at the demographic expense of the countryside. The cities seldom raised enough children to replace themselves: too few marriages, too few children, and too high a death rate. This meant then that the countryside had the burden of raising the children who, in part, filled the cities and supported the brilliant civic life of the period. This is the kind of tribute which most cities exact from the surrounding countryside.

It can be said that the age structure improved from Roman times to the thirteenth century, and possibly again in the fifteenth. The latter may be the result of the purging of less resistant elements in the population by the plague. The gain was apparently not permanent since the length of life was probably less in the sixteenth and seventeenth centuries than in the fifteenth. Indeed the length of life attained in the medieval centuries has been the source of incredulity.[9] It seemed impossible that, if the average length of life in Massachusetts in 1840 was 37.7 years, medieval expectancy was only a few years shorter. This incredulity is apparently based upon a theory of continuous improvement since the early Middle Ages. Yet surely modern length of life derives from the bacteriological and other scientific developments dating since 1840. After all, the people of nineteenth-century Massachusetts had migrated from a different and less hostile climate and were living under the unfavorable economic conditions of the early Industrial Revolution.

The effect of the age structure upon quality of leadership needs study and may well be a controversial topic. The problem is whether the relatively rapid change in leadership was significant for adjustment to conditions or not. Did it prevent men from holding to conservative positions because leaders did not attain great age in considerable numbers? This would assume that the old men would naturally be conservatives, which may or may not be accurate. Or, did the high death rate prevent men from using their years of experience to build upon the foundations laid by themselves and their ancestors? It can be said that advances were made along many lines and that society was not static during the period, but this may have been the result not so much of the age structure as of the constant changes in total numbers.

The bits of evidence about ratio of sexes in the late ancient and medieval period show that it was normally quite high. In the Roman, Carolingian, and even late medieval periods it often ran as high as 130 men to 100 women. There are places and times when the proportion was more nearly even while in the fifteenth century women outnumbered men in some of the cities. Nevertheless, high sex ratio seems to have been the usual situation. There have been comparable situations, notably in the western parts of the United States during frontier days. It is often said that the early extension of suffrage and other rights to women in those areas was caused by courtesy of their small numbers and high regard in the population. Inherently this seems reasonable and might be expected under similar conditions, assuming that the cause for such disparity of numbers was not achieved purposefully by the population.

The high sex ratio of Roman days was apparently caused by higher mortality among women but it may have been assisted by permitting girls to die at birth. However, under Roman Law in the Empire the position of women was exceptionally favorable. It was indeed in many respects equal to that of the men in regard to marriage, divorce, property, and inheritance. The tomb inscriptions seem to record generally happy marriages and devotion in wedlock. In the mystery religions women shared high ecclesiastical offices and the Vestal Virgins ranked among the most highly regarded of Romans. They held official positions even among the early Christians.

Yet as we have seen in a preceding chapter the position of women declined markedly before the law in the Middle Ages. The tendency was to regard them as descendents of Eve and to be among the great dangers facing mankind. Their function was to produce children and to help men avoid sin. They must be covered in church and dress modestly so as not to incite the passions of men. This reversal of position seems largely the product of the religious trend induced by the declining population which regarded women as one of the chief dangers to salvation of men. This position was altered at the end of the Middle Ages with increasing secularization. The adoration of the Virgin and spread of her cult are a part of the change in attitude. Even Dante, as mentioned above, chose Beatrice to be his guide through Heaven. The legal and other disabilities have lasted well past the Middle Ages, however.

The high sex ratio that seems characteristic of the later classical world and the Middle Ages makes the celibacy of the clergy of minor moment from the standpoint of total population. From the standpoint, however, of influence upon the intellectual and ecclesiastical influence it may be quite different. Celibacy prevented a large number of educated men from heading highly intellectual families. These families, had they existed, would have gone far to supply the clergy of the next generation as well as a considerable body of other leaders. Furthermore, such families would have exerted a widespread influence by example in the many

[9] By R. S. Smith in a review in *Speculum* **24**: 452, 1949.

communities and upon the children of the communities who associated with the children of the clergy. There is good reason then to believe that the celibacy of the clergy was one of the factors in the decline of the Church in the later Middle Ages. The theory is, of course, that the celibate clergy would devote more time to their ecclesiastical duties and would not try to hand on their benefices to their sons.

The period with which we are dealing then continued with the handicap of low age average although it was lightened somewhat at the end of the Middle Ages except for the inroads of the Black Death. The Middle Ages were also deprived very largely of the kind of assistance which equal rights to women would have given. However, in this they were little different from the times which had preceded and which were to follow. Equal rights for women is essentially a modern doctrine.

5. CONCLUSION

The Roman Empire continued two ideas about population which it had inherited from its predecessors: an enthusiasm for cities and a belief that population should be kept under control. The second idea was not difficult to follow since increased urbanization made for higher death rates and for a falling population. Viewing what happened from a demographical standpoint, it would seem that society accepted and rationalized the situation, believing it was for the best. From it would seem to have come that religiously minded attitude which produced the saint, the Church, and interest in the next world. These dominated the western world for nearly a millennium.

Indeed the western world owes this attitude a great deal. It emphasized the importance of the individual soul and the reality of a standard of conduct which all classes must obey. To the believer it offered the hope of a future world and of relief from the burden of sin in this world. It set up the idea of religion as something not under the control of the state: therefore man had a conscience which was not subject to the state.

The latter half of the Middle Ages saw, except for the Black Death, the usual state of increasing population. The trend was secular rather than religious although many of the expressions of the new wealth were in the old ecclesiastical patterns, endowment of monasteries, churches and schools. Even the Church developed for a time as a very powerful state. The typical trend became the development of the national state or, in instances where this failed, of great family states as those of the Hapsburgs, Hohenzollerns, and the many others. From the new wealth arose also the culture usually known as the Renaissance expressing in lay terms its ideas of art and beauty as the culture of the Middle Ages had expressed its ideas of religion in artistic forms. But until the very end of the period with which we deal the old idea of population control within limits of subsistence seems to have persisted.

How does this affect the periodization of history? The usual limits of the Middle Ages are set at about 312–476 for the beginning and about 1485–1500 at the end. In many respects the end is satisfactory from a demographic standpoint. There is a definite change in demographic attitude at this time: for the first time women outnumber men in the cities and population seems to lose connection with its environment. At the beginning 312 is probably near enough to the commencement of the real decline of population in the Roman Empire to catch the first results upon the people. It is also near the beginning of the great barbarian invasions into the empire. Furthermore the Edict of Toleration did actually mark a great change in thinking —the triumph of ecclesiastical over a secular empire. Altogether the demographic phases of history seem to conform to the conventional divisions.

Roman and medieval society thus determined its own destiny. At any time it could have thrown away its respect for the adjustment of society to subsistence and by rapid procreation have increased its numbers. Only in time of the two great plagues did loss of life go beyond the limits of potential replacement. Society also refused to make use of the machine to build up its power of creation. Upon a few occasions there was famine, notably in 1315–1317 as population reached the limits of subsistence. For the most part medieval man pursued his way conscious of his relationship to the land and to his way of life, never realizing the possibilities of the machine but also avoiding those terrible problems which modern overpopulation presents—genocide, famine, and mass warfare.

The self-control is not the control of a static society. On its demographic side there were, as we have seen, tremendous vicissitudes, eras of both rising and declining population, of steady change and catastrophic loss. Perhaps these changes are in part responsible for the varied character of the late ancient and medieval world. We need not be surprised that the [10]

Middle Ages exhibit life and color and change, much eager search after knowledge and beauty, much creative accomplishment in art, in literature, in institutions.

[10] Haskins, C. H., *The renaissance of the twelfth century*, vii–viii, Cambridge, Mass., 1928.

APPENDICES

A. SOME EASTERN ROMAN CITIES

At Antioch there exists at the middle of the *demosion* on the column of Apollo on a bronze stele an inscription reading as follows: Bartella is greater than Ephesus by 3,011 feet; Ephesus surpasses Nicomedia by 1,700 feet; Nicomedia surpasses Antioch by 1,820 feet and Alexandria is greater than these four cities since it measures 14,987 feet.

The notice is in a Syriac book which also gives the *Notitia* of Alexandria, and presumably is preserved because it mentions the city of Alexandria.[1] If it is correct the feet can hardly be Roman feet which would make the total about 4,490 m. The dimensions of Alexandria would seem to have been about:[2]

(*a*) 5,000 × 2,000 m. in the Hellenistic period,
(*b*) 3,000 × 2,200 m. in Roman Empire,
(*c*) 3,000 × 1,500 m. fifth–sixth century.

The dimensions in Roman feet thus would fit only (*c*) but would give an area less than that which may be assigned to Bartella and thus would be too small. The only other possibility would be a Phoenician foot of about .35 metre which would bring the length to about 5,200 m. While the length in (*a*) is near enough so that the lack of accuracy would make it possible, it is actually close to the length in (*b*) of both axes. Furthermore, the document is associated with the later empire and, indeed, it is hard to imagine Nicomedia important enough to be so recorded at any time earlier than the later period. Of the cities the size of Ephesus seems most ascertainable and is about 2,800 m. long and 345 hectares in size. The size of the others is obtained by assuming that the dimensions of the other places are proportionately larger or smaller. For instance Bartella's dimensions are approximately 4/3 greater in length: it is assumed that the area will be $\frac{4 \times 4}{3 \times 3}$ greater or 16/9 more than Ephesus.

Some problems are raised. Is it possible that Antioch could be so small? Since Nicomedia and Ephesus are in Asia Minor, one immediately thinks of Antioch near Pisidia which was becoming a fair-sized city at the end of the Roman Empire. The area of 130 hectares would allow for a city of only about 20,000. What, moreover, is Bartella? The only city of comparable size in Asia Minor is Smyrna, estimated very roughly at 600 hectares. Why should it be called Bartella even in Syriac?

TABLE 149

ESTIMATED AREA OF SOME EAST ROMAN CITIES

City	Feet	Metres	Hectares
Alexandria	14,987	5,245	660
Bartella	12,099		613
Ephesus	9,008	2,800	345
Nicomedia	7,308		228
Antioch	5,488		130

[1] Fraser, P. M., A Syriac *Notitia Urbis Alexandrinae, Jour. Egyptian Archaeology* 37: 104, 1951.
[2] East, W. G., *An historical geography of Europe, 27*, London, Methuen, 1948.

B. THE POPULATION OF MEDIEVAL POLAND

BY M. M. FRYDE

To the numerous factors which render most difficult an exact evaluation of the mass of population, its growth and density in the early medieval period should be added, in so far as Poland is concerned, the constant territorial changes. It was rightly observed that the mutability of the territory of Poland is a feature of that country's history.[1] Thus the student of Polish historical demography is deprived of the possibility of comparing the data pertaining to various periods.

It should also be borne in mind that in the thirteenth and fourteenth centuries an influx of population from abroad took place. There was the immigration of settlers from western Europe, the so-called "German colonization." The views of Polish historians concerning the numerical importance of this immigrants' movement are still divided. While one group is inclined to minimize its dimensions, the other admits that the Flemish, Dutch, and German colonists arrived in rather great masses. There is no doubt, however, that the figures contained in the works of German scholars are greatly exaggerated.[2]

On the passive side of the balance sheet should be mentioned the impact of the Tartar invasion of 1241. Although it affected only the southern part of Polish territory the loss of population which was massacred or removed by the Moslem invaders was very heavy. One has to note that the great epidemic of pestilence of

[1] Kietezewska, M., The geographical bases of Poland, in Wojciechowski, Z., ed. *Poland's place in Europe*, 9, Poznan, 1947.
[2] A. Meitzen (*Codex dipl. Silesia*, 1863) suggested that during the thirteenth and fourteenth centuries about 150–180,000 German peasants went to Silesia. Polish scholars are critical of this estimate. Tyc, T., *Die Anfänge der dörflichen Siedlung in deutschen Recht in Grosspolen*, trans. from Polish by M. Tyc, Wroctaw-Breslau, 1930. It should be stressed that the location under the "German Law" of villages (as well as of towns) does not mean, of course, that the new settlers were in all cases Germans. It means only that the villagers were placed under western (i.e. feudal law) which was called "German Law." For the whole controversy: Friedburg, M., *Kultura Polska a Nimiecka* (The Polish and the German culture) 1: 199 ff., Poznan, Wydawn Instytutu Zachodniego, 1946. The German approach is found in Kötzsche, R., und W. Ebert, *Geschichte der ostdeutschen Kolonization*, Leipzig, 1937.

TABLE 150

ESTIMATE OF POLISH POPULATION ABOUT A.D. 1300

Provinces	Territory in sq. km.	Population estimate	Density per sq. km.
Great Poland	60,000	242,000	4
Little Poland	54,700	191,000	3.5
Masovia	33,100	116,000	3.5
Silesia	41,000	165,000	4
Total	189,000	714,000	3.8

1347–1353 spared Poland.[3] The northern part of the country was affected by the plague in 1360, yet the destruction of human life never reached the dimensions of the great plague of 1347–1353.

The figures which are given below are based on researches and investigations conducted by Polish scholars: Krzywicki,[4] Ladenberger,[5] Mitkowski,[6] Kula,[7] and Hoszowski.[8]

Krzywicki, one of the greatest of Polish scholars, devoted one of his last studies to investigations in the field of historical demography. He uses both the comparative and the descriptive methods, taking as a basis for his retrospective analysis the data which could be established for the fourteenth century. Krzywicki's proper aim was to evaluate the mass of population at the beginning of the fourteenth century and set up the following figures as the most probable (table 150).

The results obtained by Krzywicki were recently examined and accepted by Kula[9] who had drawn attention to the fact that the Russian scholar Urlanis[10] fixed (without knowing the work of Polish scholars) the density of population in the central provinces of Poland in the tenth–eleventh centuries at about five per sq. km. and consequently assumed that the total population of the four provinces of Poland was about 950,000.

As far as the later Middle Ages are concerned there exists a possibility to base the evaluation on statistical materials. This was undertaken by Ladenberger[11] who based his conclusions on the registers of Peter's Pence paid by Poland since at least the beginning of the twelfth century, up to the middle of the sixteenth century. As the most suitable period for the investigation, the second quarter of the fourteenth century was chosen.[12] The obligation to pay this tax was imposed only on the Christian population and therefore does not include the Jews. Nor does it include the gentry, clergy, or the children under thirteen years of age.

The figures derived by Ladenberger directly from the registers of Peter's Pence gave a strong picture: it followed from them that the density of population in the provinces of Great Poland and Masovia was much less than that of Little Poland, Silesia, and Pomerania. To explain this paradoxical state of things, Ladenberger assumed that in both provinces (Great Poland and Masovia) Peter's Pence was paid in accordance with the old system (abolished already in 1318), i.e. by families and not by persons. As the family was recognized for all practical purposes of exaction of Peter's Pence as composed of three adult persons, Ladenberger multiplied the figures derived for the two provinces concerned (each person or family paid one denarius) by three. Hence the final figures established by Ladenberger differ from those established initially by him. He also attempted to introduce further correction in order to include in the figures derived from the registers, the children up to thirteen years. As a starting point he took the modern statistical data and admitted that the children constituted in the fourteenth century 33 per cent of the population. Being aware that this percentage is too high with respect to the towns he changed to 30 per cent for small towns and 25 per cent for the larger. Ladenberger introduced also some corrections (10 per cent) in order to compensate for the

TABLE 151

POPULATION OF POLAND, SECOND QUARTER OF FOURTEENTH CENTURY

Name	Area in sq. km.	Population and persons to sq. km. according to					
		Ladenberger		Mitkowski		Kula	
Little Poland	54,700	251,000	4.6	251,000	4.6	303,900	5.6
Great Poland	60,000	457,000	7.5	157,000	2.5	295,000	4.9
Massovia	33,100	134,000	4.0	45,000	1.3	58,800	1.8
Silesia	41,200	325,000	7.9	326,000	7.9	376,500	9.1
Pomerania	18,700	192,000	10.3	192,000	10.3	221,800	6.0
Total	208,300	1,300,000	6.5	971,000	4.7	1,256,800	6.0

[3] Hoszowski, S., The dynamics of the development of population in Poland during the feudal epoch (10–13th cent.) (in Polish), *Roczniki dziejow społecznych i gospudarczych* **13**: 144, 1951. His view is that the assumption made by Keyser (*BD*, 243), that the plague killed one-third of the Polish population, is without foundation.

[4] Krzywicki, L., Contribution to the investigation of demographic conditions during the era of the first Piasts in Poland (in Polish), *Przeglad Statystyczny* **1**: 177–293, 1938.

[5] Ladenberger, T., *The population of Poland at the beginning of the reign of Casimir the Great* (in Polish), Lwow, 1930. Casimir reigned A.D. 1333–1370.

[6] Mitkowski, J., Remarks concerning the population of Poland at the beginning of the reign of Casimir the Great (in Polish), *Annals* **10**: 121–134, 1948.

[7] Kula, W., The present state and needs of research in the field of historical demography of Old Poland (in Polish), *Annals* **13**: 23–110, 1951. The author contributes a Marxian interpretation in IX Hist. Congress, *Rapports* **1**: 472–503, 1950.

[8] Hoszowski, *op. cit.*, 137–198.

[9] Kula, *op. cit.*, 28.

[10] Urlanis, B. C., *Rost naselenya u Europe*, 26, Moscow, 1941.

[11] Ladenberger, *op. cit.*,

[12] Since the lack of registers for the earlier periods and the substitution of lump sums in the later offer fewer data.

TABLE 152

POPULATION ESTIMATE (IN MILLIONS) AT SPECIFIED TIMES

Area	A.D. 1	350	600*	800	1000	1200	1340	1400	1500
Greece and	3	2	1.2	2	*5*	*4*	2		1.5
Balkans	2	3	1.8	3			2		3
Asia Minor	8.8	11.6	7	8	8	7	8		*6*
Syria	4.4	4.4	4	4	2	2.7	3		2
Egypt	4.5	3	2.7	3	3	2	3		2.5
North Africa	4.2	2	1.8	1	1	1.5	2		3.5
Iberia	6	4	3.6	4	7	8	9.5		8.3
Gaul	6.6	5	3	5					
France and Low Countries					6	10	19		16
Italy	7.4	4	2.4	4	*5*	7.8	9.3		5.5
Germany and Scandinavia	3.5	3.5	2.1	4	4	7	11 .6		7 .5
British Isles	.4	.3	.8	1.2	1.7	2.8	5.3		4
Slavia	4	4.8	2.8	6					
Poland, etc.					1	1.2	1.2		2
Russia					7.5	6	8		6
Hungary					1	2	2		2
Total	54.8	47.6	33.2	45.2	52.2	61	85.9	52†	70.8

* Reductions in population for plague of sixth century: general 40 per cent, Syria, Egypt, Spain and North Africa 10 per cent.
† Total reduced 40 per cent from that of 1340
Italicized numbers based upon trends.

errors, fiscal frauds, and lack of data of exempt persons. His final figures are given in the table below.

Mitkowski's work contains a critique of Ladenberger's methods and results. It was directed mainly against Ladenberger's assumption that the system of payment was different in the second quarter of the fourteenth century in various provinces. He stressed that the sole method of payment was by head. If we follow Mitkowski we must admit that the most developed provinces of Poland have had at the beginning of the second millennium a density of population equal to that in the remotest parts of European Russia,[13] and that Poland then had during the reign of Casimir the Great (1333–1370) a population of only a half-million. No wonder that other scholars could not accept this revision.

Most probably Ladenberger based his approach to the problem on the data pertaining only to one part of Great Poland, the diocese of Poznan where the tax may have been paid by families. On the other hand, Mitkowski might be correct in so far as the remaining part of Poland is concerned. This is the ingenious hypothesis of Kula.[14] The latter also raised the estimate for children under thirteen in the population to 38 per cent.[15] He would also reduce the 10 per cent for failures of the evidence to 5 per cent, at least for Silesia and Pomerania. His other suggestions concern evaluation of population in particular districts and for the exempted classes.

As matter of fact there is no great discrepancy between the figures established by Ladenberger and those by Kula. It is worth while to note that Beloch[16] assumed that the population of Poland in 1335 was about 1,250,000, a figure which is very near to that of Kula and not far from that of Ladenberger.

The dynamics of population were dealt with by Hoszowski who in a special study[17] stresses that the figures established by his predecessors are not complete and that grave errors made by them caused a serious distortion of the picture. He believes that it is necessary to increase the established figures by 20–50 per cent. Taking, however, into consideration that all errors go in the same direction he is inclined to believe that relative numbers will be fairly correct.

During the period of the tenth–fourteenth centuries the growth of population is rather slow: 0.17 during the year and 4.2: for a period of twenty-five years. During the interval between the second quarter of the fourteenth century and the seventies of the sixteenth century the increase was 0.62 yearly and 15.6 for a quarter of a century. The first three decades of the eleventh century were favorable to the growth of population. In 1037–1038 the population sustained heavy losses because of the peasant revolt and Bohemian invasion while the effects of the Tartar invasion and fourteenth-century pestilence have already been mentioned.

[13] This was indicated by Kula (*op. cit.*, 31) who stresses that according to data based on Domesday Book the northern districts of England, adjacent to Scotland, had only four persons per sq. km. while Mitkowski attributed to Great Poland, the highest developed Polish province, only 2.5 to the sq. km. and to Masovia only 1.3.

[14] Kula, *op. cit.*, 32–33.

[15] Kula, *op. cit.*, 36–37.

[16] Beloch, J., Die Bevölkerung Europas im Mittelalter, *Zs. f. Socialwiss.* 3: 420, 1900.

[17] Hoszowski, *loc. cit.*

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